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NATIONAL MARINE FISHERIES SERVICE

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ABSTRACT

In 1981, the Massachusetts Division of Marine Fisheries continued its standardized semiannual bottom trawl survey program to monitor relative abundance of fish stocks in state territorial waters. In three-week, daytime, spring and autumn cruises, 97 and 95 stations, respectively, were completed (sampling intensity of 1 station/20 sq n mi). Seasonal abundance and distribution of 26 predominant finfish and shellfish species were described by comparing computer-generated relative abundance indices (stratified mean catch in kilograms and number per tow) to 1980 indices. For each species, indices of abundance are also presented from all prior surveys.

Despite similar cruise timing each year, the 1981 spring and autumn bottom water temperatures were the coldest and warmest, respectively, noted to date. These thermal conditions undoubtedly stimulated delays in seasonal movement of many groundfish and flounder stocks (i.e., spring/offshore, autumn/inshore) and possibly affected the production and/or distribution of offspring, most noticeably of non-endemic species. The spring cruise was as unusual for its abundance of biomass as the autumn cruise was for its comparative scarcity of all size fish, including young-of-the-year. In spring, 20 species, were at a higher level of biomass than in 1980; of these, nine were 100-300% higher; 15 were at record biomass levels and four others were at record number levels. When the fall cruise was compared to that of 1980, 19 species were less abundant in biomass; 17 species were lower in number. Ten species were at their lowest numerical level in the autumn survey timeseries.

In addition to the uniqueness of seasonal catch levels, other notable phenomena included the strong spring occurrence of young-of-the-year Atlantic cod east and south of Cape Cod; two-year-old (1979 year class) summer flounder making an unusual and significant showing in both spring and autumn catches; and a paradoxical autumn decrease in rock crab catch.

To evaluate a systematic beach seining program for predicting winter flounder recruitment, seven years (1975-81) of sampling data from six estuaries on the south shore of Cape Cod were re-analyzed following post-stratification. An eighth sampling year (1982), with number of stations proportionately allocated by estuary, was similarly analyzed. Results indicated that changes in relative year-class strength seem to be reliably detected.

Job 1: Fishery Resource Assessment, Coastal Massachusetts

INTRODUCTION

In 1978, the Massachusetts Division of Marine Fisheries (DMF) initiated a five-year, semiannual survey of fishes in the state's territorial sea as described by a three nautical mile wide border extending from Rhode Island to New Hampshire boundaries including Cape Cod Bay and, for survey purposes, Nantucket Sound (1,913 sq n mi). Specific cruise objectives were to: 1) estimate relative abundance of groundfish and certain shellfish species in terms of weight and number; 2) determine periodic trends in finfish abundance, population structure, and species composition; 3) collect information on age and growth, maturity, food habits, mortality, and recruitment; 4) describe fish distribution in relation to temperature, salinity, and depth.

The 1978, 1979, and 1980 cruises have been fully described (Howe et al 1979; Howe et al. 1980; Howe et al. 1981). Semiannual cruises from 1981 to the present have also been conducted; however, reports on these later cruises have been delayed due to a change of computer systems and the subsequent conversion of groundfish survey analysis programs at the Northeast Fisheries Center (NEFC). This report summarizes the general status of major fisheries resources noted on the 1981 cruises (#927 and #928).

FIELD AND ANALYTICAL PROCEDURES

The stern trawler F/V FRANCES ELIZABETH (55', 170 SHP) was chartered for spring and autumn bottom trawl surveys as it had been in prior years. The DMF provided a 3/4 North Atlantic type two seam trawl (39' headrope/51' footrope). Net mesh varied depending upon the section (3.5, 2.5, 1.5") and the stretch-mesh codend liner measured 0.64 cm (0.25"). The trawl was fished with a rubber disc (3.0") chain sweep, rectangular wooden doors (6' x 40", 325 lbs), and 10 fathom legs.

The study area was divided into physiographic regions which were subdivided into depth zones, i.e., strata (Figure 1). One hundred stations were allocated to strata approximately in proportion to the area of each stratum (Table 1); however, general station locations were not pre-selected from a table of random numbers which would be necessary in a strict stratified random design. The daily objective was to achieve a well-spaced station distribution pattern within a 10-hr daytime sampling period following the general station allocation scheme. At sea, the vessel captain and chief scientist decided on a general itinerary; thereafter, the captain continually searched for towable bottom. Usually,

the first-encountered trawlable bottom was sampled. With one exception, this method of station selection was utilized in all survey regions for the first eight survey cruises. Beginning on cruise 926 (autumn, 1980) and only in region 4, we adopted a randomized pre-selection method to locate stations within each stratum. Recognizing that most of Cape Cod Bay is towable, we instituted this change in procedure to remove the obligation of station selection from the vessel captain and to minimize steaming time. With the trawl warp scoped at 3:1, 20-minute tows were made along depth contours at a speed of 2.5 knots.

In processing the catch, standard survey techniques and trawl logs were employed. Following the catch sort by species, weights and length-frequencies were recorded. Materials for ageing, requested special samples, and biological observations were routinely collected during the measuring process.

Standard survey abundance indices were computed using NEFC software and the Woods Hole Oceanographic Institute's Digital VAX-11 computer following auditing of station and catch data. Individual strata were grouped by region (strata set) to make data meaningful for resource managers (Figure 1). The regions are: 1) Buzzards Bay, Vineyard Sound, and coastal water south of Martha's Vineyard; 2) Nantucket Sound; 3) East of Cape Cod, Race Point to Muskeget Island; 4) Cape Cod Bay; and, 5) Massachusetts Bay north to the New Hampshire border.

In this report we describe the abundance and distribution of 26 species which dominate bottom trawl catches and/or are of principal importance to research and management responsibility (Table 2). For each species, we present two survey indices: the stratified mean catch per tow (kilograms and number) for all strata sets, 1978-1981, and the stratified mean number per tow by length frequency interval (cm) and region, 1981 (Tables 5-57).

RESULTS AND DISCUSSION

A total of 355,909 individuals weighing 38,868.1 kg of 95 fish and shellfish species was collected and processed during the 1981 surveys. Many individuals were biologically sampled for ongoing studies by NEFC and DMF scientists (Table 3). Except for a very unusual catch of blue mussels, 13 species made up 91% of catch weight and, along with longfin squid, butterfish, and bay anchovy, accounted for 81% of the total catch in number (Table 4).

SPRING CRUISE #927

For predominant species, the 1981 spring cruise showed an unusual and conspicuous increase in abundance over the previous year. Total

biomass (weight) and number for all species showed a 60% and 11% increase, respectively, over previous highs in the spring timeseries.

Beginning with the species principally caught by us in the inshore waters of the inner Gulf of Maine (regions 4 and 5), catch biomass of the following species more than doubled over that of 1980: red hake, white hake, witch flounder, American lobster, longhorn sculpin, rock crab, and ocean pout. Species displaying less striking increases included yellowtail flounder (up 63% and 136% in biomass and number, respectively), silver hake, and American plaice. Silver hake increased 14% in biomass and the number index, like that of yellowtail flounder, was the highest in the timeseries; one- and two-year-olds were unusually plentiful for a spring survey. American plaice (dab) biomass and number indices were up 35% and down 17% respectively, reflecting growth of the strong 1979 year class and the presence of an apparently weaker 1980 year class.

Haddock remained in very low abundance in state waters. We found numbers of age 1 fish (1980 year class) comparable to numbers of the 1979 cohort a year earlier. Atlantic herring, normally a common component of spring catches north of Cape Cod, were scarce. Age 2 herring (13-15 cm) were about one-half as abundant as in 1980.

For Atlantic cod, combined strata set indices (up 12% and 27% in biomass and number, respectively) mask apparent trends observed for individual stocks. Juveniles (< 37 cm) classified by the NEFC as Gulf of Maine stock were especially plentiful throughout Cape Cod Bay where there was a 2.6-fold increase in number from the 1980 spring survey. Juveniles of the Georges Bank stock were virtually absent from the outer Cape Cod region; however, here and in southern Massachusetts regions, young-of-the-year (YOY) were ubiquitously distributed and six times more abundant than on any previous spring survey.

Biomass of both sand lance and spiny dogfish, mainly taken along outer Cape Cod and the nearby islands, was greater than in 1980 by 12%. Winter (big) skate biomass increased dramatically (177%) and numbers quadrupled.

Greater biomass and numbers were also noted for many of the predominant warm temperate and mid-Atlantic species, which return to southern Massachusetts waters in May. Summer flounder (fluke) of age group 3 and older, taken primarily in regions east and south of Cape Cod, were up threefold in number. For the first time in four years, two-year-olds (< 33 cm) made a significant appearance in survey catches. Also unusual was the simultaneous inshore arrival of one-year-old and adult scup. Sixteen times the previous spring's catch of yearlings occurred, although overall biomass was down 59%.

Little skate and northern searobin, both very common but virtually unutilized, were 2.2 times more abundant. Also more plentiful were

black sea bass, tautog, and windowpane. Exceptions to the elevated biomass noted in spring 1981 were butterfish and longfin squid, each lower by about 75% than in 1980.

Of coastwide interest, winter flounder (blackback) biomass increased by 32%. Biomass nearly doubled in regions north of Cape Cod although it declined slightly in regions south of Cape Cod. Regional 1981 prerecruit indices (stratified mean no./tow for fish ≤ 27 cm) were higher in all regions compared to 1980.

Of the 26 predominant species mentioned, 20 were observed to be at a higher level of biomass than the previous year; nine species were 100-300% higher. Fifteen species were observed at record biomass levels and four other species at record number levels for the four year timeseries. Since abundance and/or spatial distribution of fish stocks is related to sea temperature variation, it is perhaps no coincidence that in each depth stratum, we observed the lowest average bottom temperature in the timeseries (Table 58). As shown below, average coastwide surface and bottom water temperatures were lower by less than 1° C.

SPRING

		Average Temperature (°C)		Average Salinity (°/oo)
	Cruise Dates	Surface	Bottom	Surface
1978	12 May-11 Jun	13.1	10.7	31
1979	30 Apr-27 May	11.2	8.9	31
1980	5 May-24 May	10.6	9.1	32
1981	6 May-21 May	9.8	8.5	31

To what extent the observed temperature change (< 1° C) is responsible for differences in abundance is unknown.

AUTUMN CRUISE #928

Undertaken when bottom water temperatures are usually near their seasonal maxima, inshore survey catches in September generally reveal a low biomass of adult groundfish and abounding numbers of YOY. In diametric contrast to the spring survey undertaken four months earlier, and in comparison to all previous autumn surveys, the 1981 autumn cruise was unique for its relative scarcity of groundfish. Compared to fall 1980, 19 of the 26 predominant species were observed to be less abundant in biomass; 17 species were lower in number. Ten species were found to be at their lowest numerical level in the timeseries.

As in the spring, temperature conditions may have been an important contributing factor to these anomalies. Average inshore bottom water temperature (statewide) was the highest we have observed and was 1.1° C higher than in 1980, as is shown below:

AUTUMN

		Average Temperature (°C)		Average Salinity (°/oo)
	Cruise Dates	Surface	Bottom	Surface
1978	5 Sep- 2 Oct	16.1	12.8	32
1979	11 Sep- 4 Oct	15.3	12.6	31
1980	8 Sep-29 Sep	17.8	14.3	32
1981	14 Sep- 5 Oct	16.4	15.4	32

Annual mean temperature differences between 1981 (Table 58) and previous years were especially pronounced in sampling regions north of Cape Cod, where average bottom temperatures were a minimum of 2.0° C warmer than those encountered on previous surveys.

North of Cape Cod, temperature-sensitive flounders were conspicuous in their absence. American plaice, yellowtail flounder, and witch flounder (grey sole) were about 70% less plentiful than in 1980. Yellowtail were observed at significantly reduced levels (1.65 kg/tow and 6.83 fish/tow) from 1980 (3.55 kg/tow and 24.75 fish/tow). Winter flounder were 27% lower in number.

Unlike past autumn surveys, virtually no YOY Atlantic cod or haddock were taken. Number indices of age 1 cod and haddock equalled respective indices of 1980, suggesting that the 1979 and 1980 year-classes of each species were of comparable stength.

Number indices of mainly juvenile white hake and silver hake were 20% lower than in 1980. For the latter species, our declining index of prerecruit-size (16-24 cm) fish might suggest that 1979, and possibly 1980 cohorts of the Gulf of Maine stock were weaker than the two prior year classes. Continuing a four-year upward trend, red hake surged to a high weight and number index.

The rock crab, believed to increase activity with elevated water temperature, is usually more available to the survey gear in September as evidenced by higher catches; however, in 1981, catch indices plummeted significantly - biomass and number were lower by 96% and 90%, respectively. It is unknown whether the rock crab's apparent collapse was due to a marked change in availability or, possibly, offshore movement. American lobster biomass was 17% higher than in 1980, and Illex or shortfin squid, rare in survey catches one year earlier, were taken in substantial numbers.

South of Cape Cod, the third consecutive and sharp rise (56%) in the summer flounder number index reflected the increased presence of age 2 fish, not available a year before. Their relative abundance indicated that the 1979 year class was probably stronger than preceding cohorts surveyed in Massachusetts.

Predicting future recruitment from the systemmatic processing of great numbers of autumn-sampled YOY remains an intriguing possibility, particularly for species such as longfin squid, scup, black sea bass, and butterfish. For each species except Loligo squid, the 1981 overall autumn indices (all ages) and YOY indices declined. The prerecruitment index (number per tow at age 0) for scup from the 1981 autumn survey (871.~~7~~4) declined 20% from the 1980 index (1,090.3); the black sea bass index fell 34% (51.8 to 34.3); and the butterfish recruitment index dropped 81% (405.7 to 75.7). The Loligo prerecruit index was 4% higher (171.8) than in 1980 (165.1) and overall biomass was 18% higher.

Except for spiny dogfish, which were only prominent east of Cape Cod (311.3 kg/tow), most other dominant but commercially unimportant species were lower in biomass by 25-47%. These included longhorn sculpin (42%), tautog (25%), northern searobin (28%), windowpane (34%), little skate (47%), and winter skate (25%).

Major trends in abundance of predominant species should become evident in survey data over the long term, although trends are less apt to be discernable in any given inshore survey due to the study area's environmental conditions, which tend toward extremes. The comparatively depressed spring and elevated autumn sea temperatures that occurred during our 1981 surveys undoubtedly stimulated delays in the offshore (spring)/onshore (autumn) movement of many groundfish stocks and possibly affected the production and/or distribution of offspring, most noticeably of non-endemic species. Availability of some species to trawl gear might also have been temporarily altered (e.g., rock crab). These apparent distributional fluctuations would not necessarily signify population abundance or structure changes. Only by comparing past and future survey data can the 1981 phenomena be properly interpreted.

ACKNOWLEDGEMENTS

Since the 1981 survey cruises were completed, two passing years have seen changes with respect to project personnel, the vessel and fishermen, and data processing. In 1981, project members Frank Germano and Jim Buckley played significant roles in the collection of this data as did fellow employees Mark Galkowski and Bruce Estrella, both of whom augmented project personnel aboard the survey vessel during a period of deficient staffing. We thank 22 additional Division employees who assisted us at sea and others who helped with logistical details. W. Leigh Bridges administered the project and reviewed this report.

Cruise #928 marked the eighth, and last, survey conducted aboard the chartered F/V FRANCES ELIZABETH. Owner and contractor Daniel A. Arnold, Captain David Arnold, and Antone Pinto, in our judgement, adhered

to as high a standard of enthusiasm, cooperation, and dedication on the last cruise as they did on the first. We could not have received a finer record of performance from any contractor.

Significant problems in data processing were resolved in recent months with the assistance of the DMF's Don MacIsaac and a number of NEFC employees, without whose willingness to troubleshoot and communicate with us, this report would not have been possible. We specifically thank Wayne Hoover, Phil Chase, Linda Despres-Patanjo, Malcolm Silverman, and Loretta O'Brien. Donald Flescher provided timely sampling manuals and, along with Michael Fogarty, volunteered a day at sea with us.

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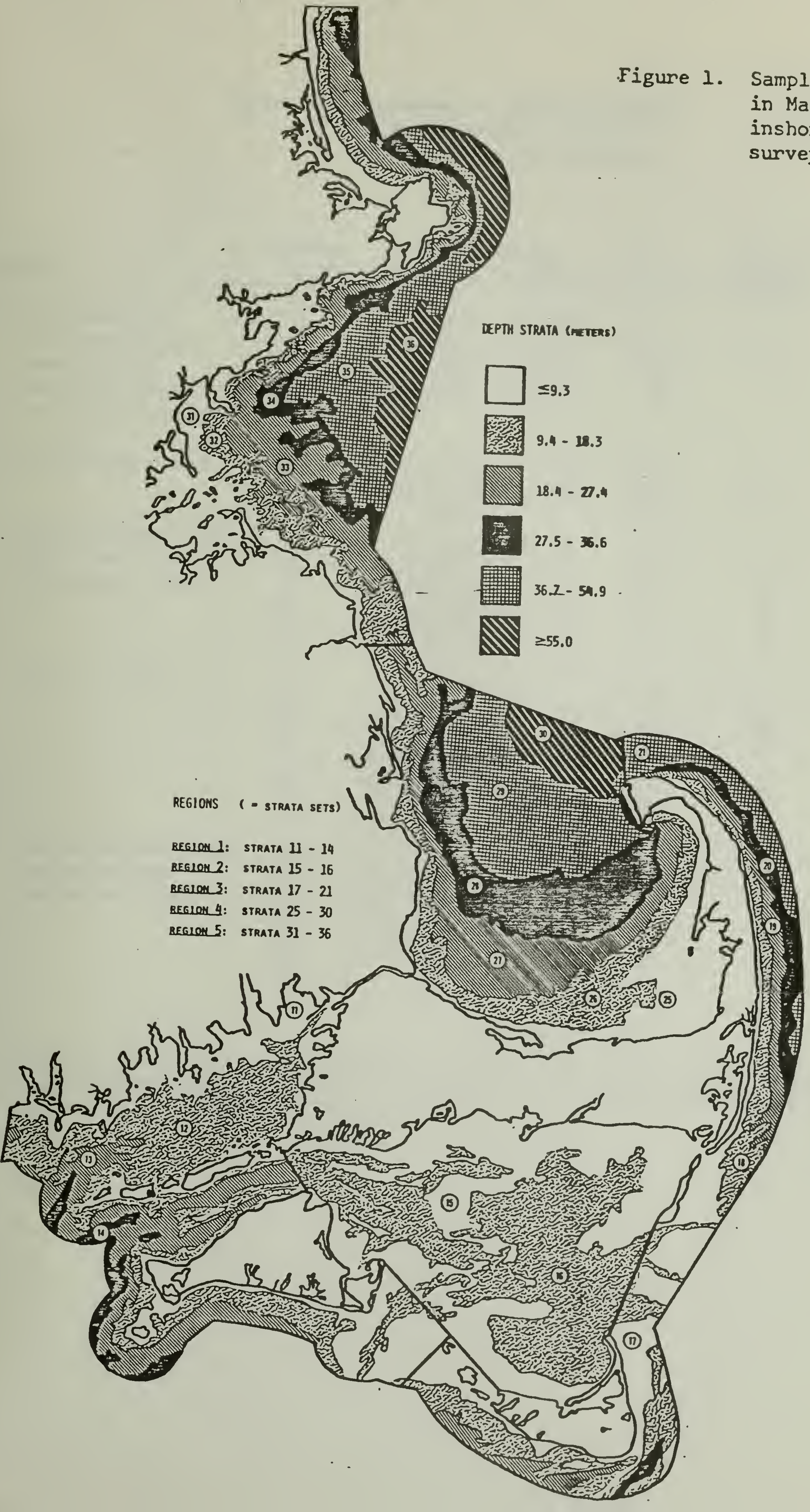

Figure 1. Sampling strata used in Massachusetts DMF inshore bottom trawl survey.

Table 1. Allotment of sampling effort to Massachusetts inshore strata, 1981 survey cruises.

Region	Stratum No.*	Depth Range Meters	Depth Range Feet	Area (sq n mi)	Number Stations Spring	Number Stations Autumn
1. Buzzards Bay Vineyard Sound and coastal water south of Martha's Vineyard	11	< 9.3	< 30	102	5	6
	12	9.4-18.3	31- 60	160	8	7
	13	18.4-27.4	61- 90	88	4	4
	14	27.5-36.6	91-120	16	2	2
2. Nantucket Sound	15	< 9.3	< 30	190	10	10
	16	9.4-18.3	31- 60	212	11	11
3. East of Cape Cod, Race Point to Muskeget Island	17	< 9.3	< 30	85	4	4
	18	9.4-18.3	31- 60	88	5	5
	19	18.4-27.4	61- 90	39	2	2
	20	27.5-36.6	91-120	24	2	2
	21	36.7-54.9	121-180	40	2	2
4. Cape Cod Bay	25	< 9.3	< 30	47	2	2
	26	9.4-18.3	31- 60	87	5	5
	27	18.4-27.4	61- 90	94	5	4
	28	27.5-36.6	91-120	93	5	5
	29	36.7-54.9	121-180	103	5	5
	30	>55.0	>181	32	2	2
5. Massachusetts Bay north to New Hampshire border	31	< 9.3	< 30	41	2	2
	32	9.4-18.3	31- 60	49	2	2
	33	18.4-27.4	61- 90	78	4	3
	34	27.5-36.6	91-120	38	2	2
	35	36.7-54.9	121-180	174	6	5
	36	>55.0	>181	33	2	3

* Sampling strata begin with #11 to coordinate with Rhode Island survey design. Strata #22-24 have been allotted to Nantucket Shoals should survey coverage be eventually extended seaward.

Table 2. Common and scientific names of species mentioned.

COMMON NAME	SCIENTIFIC NAME
Groundfish (except flounders):	
Atlantic cod	*Gadus morhua*
Haddock	*Melanogrammus aeglefinus*
Silver hake	*Merluccius bilinearis*
Red hake	*Urophycis chuss*
White hake	*Urophycis tenuis*
Scup	*Stenotomus chrysops*
Black sea bass	*Centropristis striata*
Tautog	*Tautoga onitis*
Ocean pout	*Macrozoarces americanus*
Northern searobin	*Prionotus carolinus*
Longhorn sculpin	*Myoxocephalus octodecemspinosus*
Flounder	
Yellowtail flounder	*Limanda ferruginea*
Winter flounder	*Pseudopleuronectes americanus*
Summer flounder	*Paralichthys dentatus*
American plaice	*Hippoglossoides platessoides*
Witch flounder	*Glyptocephalus cynoglossus*
Windowpane	*Scophthalmus aquosus*
Pelagics:	
Atlantic herring	*Clupea harengus harengus*
Butterfish	*Peprilus triacanthus*
Sand lance	*Ammodytes sp.*
Cartilaginous fish:	
Spiny dogfish	*Squalus acanthias*
Little skate	*Raja erinacea*
Winter skate	*Raja ocellata*
Shellfish:	
Longfin squid	*Loligo pealei*
American lobster	*Homarus americanus*
Rock crab	*Cancer irroratus*

Table 3. Summary of 1981 Massachusetts Division of Marine Fisheries bottom trawl survey cruise effort and collections, Massachusetts territorial waters.

	Cruise 927	Cruise 928
Vessel	F/V FRANCES ELIZABETH	F/V FRANCES ELIZABETH
Date	6 May - 21 May	14 Sept. - 5 Oct.
Sampling days	15	15
Stations completed	97	95
Tows aborted	4	8
Mean tow distance and range (n mi)	0.85 (0.67*-0.92)	0.81 (0.50*-0.90)
Vessel hours	184.0	176.0
DMF participants	18	20
Scientific man-hrs at sea	534	496
Number species caught	70	86
Mean no. species/tow and range	17 (9-25)	14 (4-30)
Total catch weight (kg)	25,820.9	13,047.2
Total catch number	122,691	233,218
Collections completed:		
Age, growth and maturity samples	1,216	642
Age and growth specimens	1,046	170
Pathobiological observations	1,216	1,288
Special Samples	322	130

* Denotes tow duration of less than 20 minutes.

Table 4. Weight (kilograms) and number for species collected during the 1981 spring and autumn bottom trawl surveys, Massachusetts territorial waters.

	Spring		Autumn	
Species	Wt.	No.	Wt.	No.
Winter skate	4,653.0	4,051	1,273.9	771
Ocean pout	3,553.7	6,552	130.5	465
Northern searobin	2,907.1	15,122	73.2	2,123
Little skate	2,872.9	5,719	686.0	1,242
Winter flounder	2,135.2	7,153	570.6	2,043
Red hake	1,207.3	3,243	518.3	2,783
Windowpane	1,113.3	3,690	108.1	755
Scup	899.4	15,059	1,310.1	86,097
Atlantic cod	896.1	4,664	203.8	549
Yellowtail flounder	895.4	4,261	137.6	613
Spiny dogfish	720.0	162	4,826.2	1,212
Longhorn sculpin	583.6	3,593	55.0	361
American plaice	578.7	6,135	149.6	1,230
Tautog	285.9	211	77.8	94
American lobster	243.9	873	163.2	611
Sand lance	239.6	25,186	3.2	612
Rock crab	234.8	2,216	19.0	583
Cunner	171.5	4,209	10.7	157
Silver hake	155.5	1,234	317.6	2,636
Goosefish	150.5	12	90.3	17
Smooth dogfish	124.5	29	171.7	222
Snake blenny	121.5	536	0.1	2
Spider crab	120.0	993	11.8	295
Witch flounder	106.2	133	14.1	24
Summer flounder	102.3	118	67.7	83
Sea raven	75.8	129	21.7	50
Black sea bass	71.3	121	16.5	3,238
Longfin squid	56.1	621	364.6	29,958
Pollock	50.4	416	0.8	4
Channelled whelk	47.7	171	4.8	11
Thorny skate	45.3	22	0.9	2
Fourspot flounder	45.0	176	23.3	138
Moonsnail unclass.	40.7	446	6.1	58
Horseshoe crab	35.6	40	28.4	18
Atlantic herring	34.7	536	8.7	102
Shrimp unclass.	33.7	-	-	-
Alewife	28.8	420	5.5	26
White hake	25.0	436	84.8	906
Sea scallop	21.2	101	5.0	142
Lady crab	21.1	1,250	33.5	1,222
Haddock	21.0	148	13.6	48
Blueback herring	15.3	335	0.1	10
Knobbed whelk	14.9	18	6.2	14
Butterfish	9.9	91	245.4	11,126
Jonah crab	8.7	55	8.6	60
Atlantic wolffish	8.0	2	5.9	2

Table 4. (Continued)

Species	Spring Wt.	Spring No.	Autumn Wt.	Autumn No.
Mussel unclass.	7.7	273	762.8	67,767
Fourbeard rockling	5.8	111	2.0	26
Grubby	4.6	385	-	-
Rainbow smelt	4.3	669	0.0	2
Rock gunnel	3.4	227	0.3	13
Striped searobin	3.3	6	0.0	6
Quahog	2.7	7	-	-
Surf clam	2.5	11	2.7	30
Pipefish	2.4	45	1.3	518
Ocean quahog	2.2	11	1.3	8
Lumpfish	2.2	1	0.0	1
American eel	1.9	3	-	-
Atlantic halibut	1.7	1	-	-
Wrymouth	1.5	2	1.6	2
Alligatorfish	0.9	152	0.1	22
Atlantic mackerel	0.8	1	5.2	276
American shad	0.6	12	0.3	1
Daubed shanny	0.6	57	-	-
Bay scallop	0.3	11	0.2	6
Mantis shrimp	0.1	3	-	-
Moustache sculpin	0.1	2	-	-
Octopus unclass.	0.0	7	-	-
Bay anchovy	0.0	4	12.5	10,796
Atlantic silverside	0.0	1	0.1	14
Shortfin squid	-	-	124.7	360
Atlantic stingray	-	-	113.4	1
Atlantic torpedo	-	-	90.2	3
Bluefish	-	-	24.7	145
Sand tiger	-	-	13.1	1
Northern puffer	-	-	3.2	160
Oyster toadfish	-	-	3.1	9
Weakfish	-	-	1.8	113
Mackerel scad	-	-	1.7	145
Kingfish	-	-	1.7	23
Blue crab	-	-	1.0	7
Redfish	-	-	1.0	2
Spotted hake	-	-	0.9	7
Hogchoker	-	-	0.6	5
Orange filefish	-	-	0.5	13
Lizardfish	-	-	0.3	2
Atlantic menhaden	-	-	0.3	1
Bigeye scad	-	-	0.1	2
Striped anchovy	-	-	0.0	4
Snakefish	-	-	0.0	3
Seasnail	-	-	0.0	2
Conger eel	-	-	0.0	2
Striped cusk-eel	-	-	0.0	1
Gray snapper	-	-	0.0	1
Gauguanche	-	-	0.0	1
TOTAL	25,820.9	122,691	13,047.2	233,218

Table 5. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of all species for all Massachusetts inshore strata sets, spring and autumn, 1976 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	176.01	112.91-239.11	833.07	492.91-1173.23	0.21
1979	169.16	139.08-119.25	718.70	524.56- 912.83	0.24
1980	161.70	113.80-209.61	1099.83	426.90-1772.76	0.15
1981	258.11	214.64-301.58	1220.09	971.43-1468.74	0.21

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	315.38	135.23-495.53	3310.90	2279.92-4341.88	0.10
1979	139.74	101.91-177.58	2029.87	1604.97-2454.77	0.07
1980	120.04	90.12-149.96	2711.74	2019.01-3404.48	0.04
1981	134.50	71.30-197.71	2517.17	507.91-4526.42	0.05

---

* Negative lower limit.

Table 6. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of Atlantic cod for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	5.63	3.66- 7.59	45.67	21.34- 70.00	0.12
1979	9.85	3.15-16.56	54.12	23.71- 84.53	0.18
1980	9.08	6.07-12.10	39.63	27.33- 51.94	0.23
1981	10.22	3.62-16.82	50.35	32.63- 68.07	0.20

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	1.47	* - 3.52	76.25	28.19-124.32	0.02
1979	0.50	0.06- 0.94	4.04	1.67- 6.41	0.12
1980	0.75	0.17- 1.33	7.11	2.57- 11.65	0.11
1981	3.06	* - 6.72	7.80	* - 15.66	0.39

* Negative lower limit.

Table 7. Stratified mean number per tow (untransformed) for Atlantic cod length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

	SPRING					AUTUMN				
	Regions									
h	1	2	3	4	5	1	2	3	4	5
1										
2	.055				.189					
3	.439	.477	.383		4.119					
4	3.404	2.774	3.524	.317	11.142					
5	10.098	8.765	9.639	1.360	15.241					0.027
6	14.056	8.666	8.078	.925	5.902					
7	11.054	2.827	1.387	.314	1.335					
8	4.419	1.676	.268	.121	.119					
9	.822	.096	.064	.041	.119					
10	.060			.038	.391				0.052	0.253
11				.079	.059					
12			.071	.411	.178				0.103	0.483
13				.936	1.645			0.217		0.690
14				.914	2.551			0.435	0.035	0.475
15				.695	2.832			0.652		0.445
16				.328	1.367			0.797		0.774
17				.564	1.527			0.652		0.176
18				.523	2.050			0.362		0.253
19				.739	1.866			0.435		
20	.044			1.310	3.845			0.217		0.169
21				1.642	3.372			0.217	0.035	0.253
22				1.897	2.860					0.383
23	.060			1.964	2.006			0.145		0.421
24				1.478	2.191			0.145	0.035	1.158
25				.703	1.725					0.421
26			.141	.832	.774					1.348
27				.583	2.294				0.070	0.758
28				.761	1.505				0.316	1.601
29				.292	1.609			0.145	0.316	1.011
30				.505	2.496			0.145	0.526	0.927
31			.043	.128	1.972			0.145	0.491	0.843
32			.043	.125	3.262				0.702	0.758
33			.072	.257	4.143				0.421	0.758
34				.579	3.845				0.526	0.758
35				.361	3.039				0.491	1.601
36				.714	4.747				0.491	1.180
37				.561	3.808				0.140	1.095
38				.914	2.199				0.035	1.011
39				.661	1.425				0.070	1.264
40				.682	3.617					1.011
41				.440	2.392				0.070	1.038
42				.176	.706				0.035	0.927
43				.360	1.271					0.337
44			.072	.161	1.260					0.616
45				.045	1.013					0.421
46				.082	.753					0.169
47				.179	.483					0.169
48			.072	.159	1.372					0.364
th										

Table 7. (Cont.)

Length (cm)	SPRING Regions 1	2	3	4	5	AUTUMN 1	2	3	4	5
9				.132	.163					0.169
50				.169	.473					0.111
1					.117					0.337
2				.086	.512				0.035	0.084
3				.052	.318					
4			.072	.083	.410					
5				.132	.047				0.035	
6				.041	.186				0.035	
7				.038						0.169
8			.072	.045	.567					
9			.072	.086	.134					
60				.041	.366					0.027
1				.041	.047					
2			.072	.221	.070					0.084
3				.090						0.084
4										
5										
6			.043							
7				.045	.140					
8			.072		.070					
9										
70										
1				.041						
2										
3										
4										
5										
6										
7										
8				.090						
9										
80					.070					
1										
2										
3										
4				.045						
5				.045						
6					.040					
7										
8										
Total x̄ Length										

Table 7. (Cont.)

Regions

	SPRING					AUTUMN				
	1	2	3	4	5	1	2	3	4	5
9										
90										
1										
2										
3										
4				.041						
5										
6										
7										
8										
9										
100										
1										
2			.043							
3										
4										
5										
6										
7										
8										
9										
110										
1										
2										
3										
4										
5										
6										
7										
8										
9										
120										
1										
2										
3										
4										
5										
6										
7										
8										
tal ength	44.51 6.13	25.280 5.63	24.310 6.98	28.423 25.60	122.346 22.53			4.710 18.28	5.067 32.21	27.410 31.89

Table 8. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of haddock for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	0.27	0.02-0.53	0.46	0.04- 0.87	0.60
1979	0.02	* -0.04	0.12	* - 0.28	0.15
1980	0.27	0.11-0.44	2.12	0.75- 3.49	0.13
1981	0.25	0.07-0.43	1.94	0.59- 3.29	0.13

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	0.00	0.00-0.00	0.01	* - 0.02	0.00
1979	0.06	0.04-0.08	7.19	4.43- 9.94	0.01
1980	0.16	0.05-0.28	7.83	2.56-13.09	0.02
1981	0.14	* -0.33	0.52	* - 1.11	0.27

* Negative lower limit.

Table 9. Stratified mean number per tow (untransformed) for haddock length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

Regions

	SPRING					AUTUMN				
	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5										
6										
7										
8										0.111
9										
10										
11										0.169
12										
13										
14			.072		.070					
15					.140					
16			.072		.327					
17					.421					
18			.116	.105	.351					
19				.111	.608					
20				.392	1.311					
21				.211	.843					
22			.043	.105	.772					
23				.035	.772				0.035	
24				.070	.562					0.084
25				.111	.492				0.035	0.084
26				.045					0.070	
27				.070	.211				0.070	
28					.140				0.105	0.169
29									0.140	0.169
30									0.140	0.084
31									0.140	0.084
32									0.140	
33					.070				0.175	
34									0.070	0.084
35									0.105	
36										
37					.070					
38					.070					
39										
40										
41					.040					
42										
43					.040					
44										
45										
46										
47										
48										
gth										

Table 9. (Cont.)

	SPRING					AUTUMN				
	Regions									
gth m)	1	2	3	4	5	1	2	3	4	5
9										
50					.040					
1										
2										
3										
4										
5										
6					.040					
7										
8										
9										
60										
1										
2										
3										
4										
5										
6										
7										
8										
9										
70										
1										
2										
3										
4										
5										
6										
7										
8										
9										
80										
1										
2										
3										
4										
5										
6										
7										
8										
1			.304	1.255	7.391				1.228	1.038
ngth			17.14	21.44	22.00				30.40	23.59

Table 10. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of silver hake for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	0.63	0.24-1.02	4.85	2.70- 7.00	0.13
1979	1.89	* -3.92	7.72	3.02-12.41	0.24
1980	1.54	* -3.13	10.65	3.63-17.67	0.14
1981	1.76	0.60-2.93	15.34	5.89-24.79	0.12

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	1.86	0.75-2.98	45.38	19.16-71.60	0.04
1979	3.11	2.16-4.05	41.74	32.93-50.55	0.07
1980	3.27	0.81-5.74	34.62	17.56-51.69	0.09
1981	3.61	2.41-4.82	27.60	18.69-36.51	0.13

* Negative lower limit.

Table 11. Stratified mean number per tow (untransformed) for silver hake length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

	SPRING					AUTUMN				
	Regions									
	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4								.071		
5				.041				.191		
6					.140	.781		.651	.121	
7					.361	1.880		.346	.129	
8				.339	.501	3.789		.332	.052	
9	.164		.064	.620	.806	1.598				
10	.060	.096	.128	.995	2.129	.921		.134	.038	.027
11	.116			.788	4.552				.035	.027
12	.231	.096		1.014	4.808	.046			.070	
13	.120		.141	.764	5.253			.116	.527	.390
14				.367	4.254			.116	.753	.961
15				.292	2.870			.391	.940	1.318
16				.045	.978			.609	1.041	1.682
17					.678			.739	1.988	.677
18				.123	.834			.652	3.510	1.382
19				.082	1.108			2.551	4.633	.676
20					.979			2.638	5.170	1.006
21				.045	1.355			5.493	6.218	.721
22				.121	1.356			5.681	4.591	.133
23				.267	1.427	.022		2.174	4.045	.222
24				.439	1.049			1.710	3.016	.279
25				.620	1.234			.623	1.901	.658
26	.240			.434	1.391			1.377	2.748	1.060
27	.361			.636	1.381				2.823	1.251
28	.224		.185	.939	1.541				2.500	3.579
29	.404		.141	.770	1.053				3.172	2.435
30	.973		.141	.484	1.988				3.383	2.435
31	.541		.424	.312	.516				1.621	2.741
32	.574		.283	.312	.719				1.927	1.523
33	.262		1.272	.041	.631				1.862	1.332
34	.137		1.130	.168	.117				1.465	1.486
35	.164		.989	.045	.375				.879	.410
36	.022		.848	.041	.281				.467	.475
37	.060		1.272	.041	.140				.612	.130
38	.104		.283	.086	.070				.522	.084
39		.048	.141	.041					.226	.169
40	.137		.989	.045	.281				.316	.222
41		.048			.047				.251	.195
42	.055		.141	.086	.092				.090	.299
43				.079	.117				.261	.111
44			.283		.070				.045	.337
45										
46					.070				.271	.111
47	.022				.070				.045	
	.022								.206	

th

Table 11. (Cont.)

	SPRING					AUTUMN				
	Regions									
gth m)	1	2	3	4	5	1	2	3	4	5
9	.022									.084
50										
1										
2										
3										
4										.084
5										
6										.084
7										
8										
9					.070					
60										
1										
2										
3										.084
4										
5										
6										
7										
8										
9										
70										
1										
2										
3										
4										
5										
6										
7										
8										
9										
80										
1										
2										
3										
4										
5										
6										
7										
1	5.013	.288	8.854	11.521	47.697	9.037		26.596	64.469	30.3
ngth	28.50	20.67	34.58	20.45	18.49	8.06		20.25	24.54	27.0

Table 12. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of red hake for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	3.40	* - 7.70	11.12	* -26.00	0.31
1979	11.85	* -27.02	33.71	* -74.54	0.35
1980	3.03	1.24- 4.81	16.00	2.62-29.38	0.19
1981	12.01	* -28.46	34.77	2.06-67.48	0.34

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	2.57	1.83- 3.31	8.31	5.47-11.14	0.31
1979	2.75	1.84- 3.66	12.77	6.66-18.88	0.22
1980	3.44	1.77- 5.10	18.09	7.44-28.73	0.19
1981	6.12	3.68- 8.57	32.87	19.93-45.80	0.19

* Negative lower limit.

Table 13. Stratified mean number per tow (untransformed) for red hake length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

	SPRING					AUTUMN				
	Regions									
	1	2	3	4	5	1	2	3	4	5
1										
2										
3	.056							0.765		
4				.041				0.255		
5				.041				1.786		
6								2.551		
7								2.551		
8					.070	0.175		0.765		0.063
9				.076	.281			1.530		
10				.658	1.707			0.255	0.045	
11				.536	2.668					
12		.096		1.069	3.441					
13	.060	.144		1.101	5.546					
14		.048	.071	.692	2.877					
15		.048		.611	3.017					0.364
16	.060	.144		.699	2.380				0.090	0.889
17	.022	.048		.856	2.333	0.022			0.244	4.339
18		.048		.328	1.866	0.022			0.382	6.818
19				.288	.521	0.044			0.668	7.791
20	.022			.041	1.358	0.044			1.336	11.407
21	.066			.214	.632	0.022			1.184	8.308
22				.041	.116	0.044			3.359	4.966
23					1.053	0.022			5.996	4.092
24	.060			.045	1.585				6.273	1.329
25	.060			.210	1.585	0.022			4.167	2.175
26				.127	1.545				3.859	1.113
27	.120			.258	1.103				1.933	1.015
28	.306			.503	1.374				1.120	0.954
29	1.109			.312	1.274				1.080	0.747
30	1.027			.752	2.992				1.279	0.696
31	.596		.918	.418	.890				1.696	2.781
32	1.016		.918	.553	1.559				2.389	2.275
33	.721			.453	1.334				1.839	3.323
34	1.071		3.745	.164	.621				1.823	1.638
35	.902		.918	.286	1.023				2.514	1.727
36	1.077		2.755	.460	.970				1.432	2.940
37	1.262	.048	11.163	.327	1.023				1.636	1.428
38	1.307		20.418	.296	.632				1.882	1.592
39	.689		12.082	.168	.562				1.164	1.689
40	.579		9.390	.082	1.172				0.668	1.140
41	.744		3.745	.327	.891				0.583	1.339
42	.579		9.326	.205	.702				0.633	1.275
43	.377		13.918	.247	.632				0.643	1.229
44	.279		4.663	.086	.340				0.723	0.639
45	.317		8.337	.246	.387				0.386	0.475
46			5.582	.082	.180				0.211	0.448
47	.066		3.745	.127	.180				0.296	0.279
48			.071		.059				0.211	

Table 13. (Cont.)

	SPRING					AUTUMN				
	Regions									
ngth cm)	1	2	3	4	5	1	2	3	4	5
9	.066		.918	.120					0.035	0.164
50				.082	.200				0.125	0.222
1			1.837	.038					0.351	
2				.079					0.070	0.053
3				.164					0.261	0.084
4				.045	.140				0.111	
5					.070				0.196	
6									0.045	
7									0.090	
8									0.080	0.084
9									0.090	
60										
1									0.035	
2										
3										
4										
5										
6										
7										
8										
9										
70										
1										
2										
3										
4										
5										
6										
7										
8										
9										
80										
1										
2										
3										
4										
5										
6										
7										
8										
al	14.615	.623	114.520	14.554	54.891	0.415		10.458	55.238	83.891
ength	35.14	16.31	40.62	24.77	22.96	15.26		6.49	29.58	25.91

Table 14. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of white hake for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	0.95	* -2.23	4.23	0.34- 8.12	0.22
1979	0.34	* -0.77	2.23	0.82- 3.65	0.15
1980	0.12	0.04-0.20	2.29	0.54- 4.04	0.05
1981	0.28	0.12-0.44	4.79	2.69- 6.89	0.06

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	0.80	0.55-1.05	13.72	9.68-17.76	0.06
1979	0.78	0.44-1.12	7.25	4.42-10.09	0.11
1980	1.01	0.71-1.31	12.91	9.40-16.43	0.08
1981	0.97	0.54-1.40	10.34	5.04-15.64	0.09

* Negative lower limit.

Table 15. Stratified mean number per tow (untransformed) for white hake length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

gth n)	SPRING 1	SPRING 2	SPRING 3	SPRING 4	SPRING 5	AUTUMN 1	AUTUMN 2	AUTUMN 3	AUTUMN 4	AUTUMN 5
1										
2										
3										
4						.046				
5						1.563				
6			.064							
7	.055				.070	.781		.145		
8			.064	.125	.047	.062				
9	.109	.048		.317	.588	.828				
10			.071	.567	.613	1.609				
11	.333			.964	1.397	1.609				
12	.437	.096		1.271	.553	.046				
13	.224	.144		.876	.492			.377		
14	.060	.048	.072	1.064	.331			.145	.092	
15	.055			.910	.493			.507	.206-	
16	.055			.680	.329	.828		.783	.052	.169
17				.529	.377	.046		.841	.155	.130
18				.386	.212	.046		1.681	.593	.379
19		.048		.082	.282			2.841	.531	.414
20				.210	.844	.046		2.377	.571	.839
21				.173	.235			1.536	1.495	1.734
22				.086	.070			1.855	1.601	2.385
23					.421	.781		.435	1.919	1.898
24				.168	.211			.435	1.558	2.154
25				.082	.419				1.243	1.812
26				.198	.184			.145	.802	1.601
27				.086	.324			.145	.267	.785
28				.122	.419			.145	.187	.337
29				.349	.232				.393	.027
30				.086					.357	.138
31				.082	.070				.090	.084
32				.132					.316	
33					.046				.251	.130
34				.041	.070				.226	.126
35				.041					.090	.027
36			.071						.080	
37			.071	.131	.070				.136	
38									.090	.084
39				.045					.271	
40									.266	
41			.141						.080	
42										
43									.080	.084
44									.035	
45				.045						
									***	
54									.045	
	1.328	.384	.553	9.845	9.400	8.341		14.391	14.080	15.336
gth	11.84	13.13	24.52	16.38	17.32	10.87		19.41	24.86	23.60

Table 16. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of scup for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	17.81	* -46.30	50.48	* - 123.22	0.35
1979	9.63	0.25-19.00	40.65	3.44- 77.86	0.24
1980	22.95	* -65.18	104.74	* - 284.58	0.22
1981	9.48	2.28-16.67	159.41	27.72- 291.10	0.10

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	14.26	9.42-19.11	1797.25	1026.82-2567.68	0.01
1979	11.38	7.92-14.84	1088.63	746.06-1431.21	0.01
1980	12.08	8.77-15.39	1141.45	792.69-1490.21	0.01
1981	13.51	6.42-20.60	911.16	258.59-1563.73	0.02

* Negative lower limit.

[illegible] Stratified mean number per tow (untransformed) for scup length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

	SPRING					AUTUMN				
	Regions									
th)	1	2	3	4	5	1	2	3	4	5
						7.951				
						80.715	4.662			
						700.177	104.647	14.289	14.224	
		.671				1828.783	283.432	81.350	21.851	
	.055					674.684	394.187	62.796	2.731	
	9.181					50.139	150.601	3.061	.038	
	125.891	1.629				1.311	9.469			
	260.364	15.273					.095			
	147.142	42.052	.701			.235				
	8.664	16.863	1.594			3.179	1.714			
	1.612	2.681	.064			41.994	8.080	.141	.052	
	3.486	1.677	.191			38.614	13.072	.064		
	11.185	10.445	.191			20.298	10.212	.064	.155	
	24.944	22.896	.128			8.563	3.520	.077	.090	
	15.633	20.304	.446			.603	1.332		.128	
	16.477	16.046	.128	.035		1.602	1.562			
	6.721	5.547	.383			3.969	3.841	.064	.052	
	6.256	3.486				10.120	2.942		.155	
	3.437	1.372				1.589	1.564			
	4.808	1.572	.064			1.852	.999			
	.997	.947				.553	1.658		.052	
	.551	.475				1.118	2.320			
	1.131	.284	.064			.294	2.038			
		.189				.517	1.278			
	.109	.142	.064			.247	1.090			
		.047				.125	1.467			
		.332				.625	1.373			
		.047				.372	1.087	.071		
		.095				.250	.851			
		.047					.520			
		.047				.232	.473			
							.095			
						.093	.284			
		.047					.095			
							.095			
						.093				
						.093				
	648.644	165.214	4.017	0.035		3480.990	1010.650	161.976	39.525	
h	12.15	15.28	15.22	19.00		7.33	8.37	7.37	6.91	

Table 18. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of black sea bass for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	0.37	* -0.77	1.12	* - 2.82	0.33
1979	0.40	0.10-0.69	0.54	0.17- 0.91	0.74
1980	0.43	0.13-0.73	0.54	0.16- 0.93	0.79
1981	0.71	0.32-1.11	1.19	0.52- 1.86	0.60

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	0.48	0.18-0.78	43.77	* -95.96	0.01
1979	0.61	0.32-0.91	40.71	1.33-80.09	0.02
1980	0.55	0.24-0.85	52.37	18.53-86.22	0.01
1981	0.17	0.08-0.26	34.86	6.99-62.74	0.005

* Negative lower limit.

Table 19. Stratified mean number per tow (untransformed) for black sea bass length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

	SPRING					AUTUMN				
	Regions									
gth n)	1	2	3	4	5	1	2	3	4	5
1										
2						.180				
3						6.781				
4						36.144	1.527			
5						74.875	3.910	.319		
6						35.633	2.610	.977		
7						10.283	1.424	.531		
8						1.140	0.284	.264		
9						1.486		.145	.052	
10							.144	.222		
11							.048	.072	.045	
12										
13										
14										
15										
16										
17										
18										
19										
20	.060									
21										
22	.078									
23	.132	.142								
24	.297	.142	.143							
25	.513	.332	.141							
26		.475	.072							
27	.110	.378	.071				.096			
28	.055	.236					.048			
29	.055	.047				.109	.288			
30	.055	.047				.046	.384			
31							.623			
32	.109						.240			
33		.142					.192			
34	.056	.143	.077				.096	.064		
35	.110	.047								
36	.060	.331					.048			
37		.047					.048			
38		.048								
39		.048				.062				
40	.111	.047					.048			
41	.110	.142								
42		.048								
43	.056	.047								
44	.115	.142								
45		.095								
46										
47		.047					.048			
		.095				.062				
l ngth										

Table 19. (Cont.)

gth n)	SPRING 1	SPRING 2	SPRING 3	SPRING 4	SPRING 5	AUTUMN 1	AUTUMN 2	AUTUMN 3	AUTUMN 4	AUTUMN 5
							Regions			
-										
8										
5										
1										
2										
3										
4										
5										
6										
7										
8		.047								
9	.056									
6										
1										
2							.048			
3		.048								
4										
5										
6										
7										
8										
9										
7										
1										
2										
3										
4										
5										
6										
7										
8										
9										
8										
1										
2										
3										
4										
5										
6										
7										
8										
1	2.138	3.363	0.505			166.804	12.152	2.594	0.097	
ngth	30.30	32.78	26.51			5.14	10.41	[illegible]	[illegible]	

Table 20. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of tautog for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	4.48	0.88-8.09	2.36	0.55-4.17	1.90
1979	5.16	1.54-8.78	2.89	1.02-4.77	1.78
1980	4.13	1.25-7.01	1.91	0.64-3.18	2.17
1981	2.86	1.38-4.34	2.16	1.00-3.31	1.33

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	0.72	0.05-1.39	0.46	0.06-0.87	1.56
1979	0.57	0.19-0.95	1.57	* -3.24	0.36
1980	1.05	0.24-1.86	4.50	* -9.95	0.23
1981	0.79	0.12-1.47	0.96	0.36-1.56	0.83

* Negative lower limit.

[illegible] Stratified mean number per tow (untransformed) for tautog length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

gth m)	SPRING 1	2	3	4	5	AUTUMN 1	2	3	4	5
1										
2										
3										
4										
5							.047			
6										
7										
8							.047			
9										
10	.110								.038	
11	.110									
12	.056						.047			
13	.110									
14	.056								.090	
15	.446								.038	
16	.277	.047				.109	.047		.103	
17	.225					.093	.047		.179	
18	.227	.047				.155	.095			
19	.448						.047		.052	
20	.055	.047				.093	.047			
21	.444						.142			
22	.222						.142		.090	
23	.166					.109				
24	.220					.109	.047			
25	.165	.048					.047		.052	
26	.227					.046	.048		.052	
27	.110	.048				.046	.047			
28		.047								
29	.056	.047				.062				
30	.164					.062	.047			
31	.282					.046	.048			
32	.221					.155			.079	
33	.056	.095								
34	.167	.047				.109				
35	.278	.047					.047			
36	.170	.047		.052		.062				
37	.165	.048				.062				
38	.277	.096					.047			
39	.277					.062	.047			
40	.055	.191	.077			.264				
41	.556					.093	.047			
42	.056	.190				.248				
43	.166	.189		.038		.062				
44	.279									
45	.167	.095								
46	.056	.191			.059	.062				
47	.166	.095				.155				
48	.110	.095								
gth										

ble 21. (Cont.)

ngth cm)	SPRING 1	2	3	4	5	AUTUMN 1	2	3	4	5
	Regions									
9		.047				.093			.045	
5	.056					.062	.048			
1	.056	.047				.218				
2	.110	.142								
3	.056									
4	.056	.142								
5	.111	.142								
6	.056	.095								
7	.056	.047								
8		.190								
9		.095								
6	.055	.048								
1										
2										
3										
4										
5										
6										
7										
8										
9										
7										
1										
2										
3										
4										
5										
6										
7										
8										
9										
8										
1										
2										
3										
4										
5										
6										
7										
8										
	8.008	2.754	0.077	0.090	0.059	2.642	1.231		0.817	
th	30.75	44.36	40.00	38.98	46.00	35.18	24.17		21.09	

Table 22. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of ocean pout for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	21.10	8.72-33.48	45.88	25.01-66.74	0.46
1979	22.82	15.88-29.76	44.80	29.93-59.68	0.51
1980	16.13	10.43-21.84	28.70	17.87-39.54	0.56
1981	35.04	24.58-45.50	62.43	42.12-82.73	0.56

AUTUMN

1978	1.48	0.88- 2.08	18.66	10.08-27.23	0.08
1979	2.15	1.35- 2.95	25.05	14.97-35.14	0.09
1980	1.92	0.64- 3.21	13.94	4.76-23.12	0.14
1981	1.91	0.77- 3.06	6.67	3.05-10.28	0.29

* Negative lower limit.

Table 23. Stratified mean number per tow (untransformed) for ocean pout length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

h	SPRING					AUTUMN				
	Regions									
	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5										
6				.118						
7				.800						
8				.279						
9										
10										
11					.040					
12				.587						
13				.456	.281					
14				1.404	.140				.041	.084
15				.316	1.625				.079	
16				1.346	1.274					.084
17				2.495	1.754					.027
18	.284			1.868	.719					
19	.240			3.732	1.195					.027
20	.131			3.993	.492					.027
21	.131			3.347	.351					
22	.306			3.033	.328				.307	.084
23	.153			1.175	.772				.267	.616
24	.568			1.927	1.404				.226	.448
25	.306			2.351	1.053				.207	.475
26	.459			3.959	1.499				.181	.701
27	.612			3.134	1.609				.386	.421
28	.874			3.023	2.171				.125	.674
29	.306			2.675	.844				.045	.169
30	1.639			2.568	1.990				.125	.506
31	.984			3.411	.890				.316	.532
32	.896			4.046	.913				.241	.758
33	.066			2.908	.960				.267	.701
34	.153			3.104	.690				.532	.804
35	.361			1.920	.866				.361	.674
36	.984		.043	1.970	1.277				.316	1.459
37	.678			3.057	.868				.316	1.180
38	1.290			2.933	1.044				.261	.843
39	1.224			2.457	.850				.316	.532
40	.940			3.280	1.317				.226	.785
41	1.546			3.464	.561				.402	.701
42	1.290			4.092	.832				.361	.674
43	.847			3.718	.990				.407	.616
44	1.421			1.726	1.332				.216	.616
45	.454			4.680	.662				.351	.506
46	.896			2.474	1.219				.271	.390
47	.809			3.416	2.084				.316	.927
48	.656			4.979	2.402				.136	.506
th										

Table 23. (Cont.)

	SPRING					AUTUMN				
	Regions									
th)	1	2	3	4	5	1	2	3	4	5
	.874			4.994	1.466				.136	.616
5	.852			5.502	4.280				.226	.616
	.984			4.880	2.127				.041	.521
	.787			4.536	2.851				.080	.364
3	.721		.071	4.456	3.040				.045	.636
	.219			3.904	1.673				.045	.521
	.284			4.119	3.132					.215
	.328			3.613	2.098				.035	.253
	.219			2.337	2.570					
	.175			3.359	1.533					.169
	.219			2.647	1.053				.045	.084
6	.066			5.477	2.410					.084
	.066		.064	2.248	1.426					
2				1.952	.599					
3			.072	2.349	.939					
				1.887	.594					.084
				.859	.507					
				1.139	.107					
				1.041	.444				.045	
			.043	1.348	.401					
				.887	.119					
7				1.001	.541					
				.402	.119					
				.573						
				.476						
			.043	.556						
				.964						
				.241	.047					
				.515	.059					
				.421						
				.082						
8			.072	.463						
				.477						
				.354						
				.041						
				.271						
				.121						
				.156						
th										

Table 23. (Cont.)

	SPRING					AUTUMN				
	Regions									
	1	2	3	4	5	1	2	3	4	5
				.271						
9				.079						
	—	—					—	—		
10										
11										
12										
	27.295		0.410	173.218	73.433				8.301	21.70
th	39.68		62.80	42.93	42.99				36.79	38.93

Table 24. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of northern searobin for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
			SPRING		
1978	14.74	* -41.02	75.95	* -214.10	0.19
1979	11.81	1.40-22.21	64.01	6.81-121.21	0.18
1980	12.53	0.61-24.43	55.37	2.82-107.92	0.23
1981	29.04	1.57-56.50	150.94	15.39-286.49	0.19
			AUTUMN		
1978	3.81	* - 9.12	21.56	2.24- 40.88	0.18
1979	4.20	* - 8.94	34.57	12.94- 56.19	0.12
1980	0.97	* - 1.43	19.35	10.99- 27.71	0.05
1981	0.70	0.07- 1.33	23.40	* - 47.70	0.03

* Negative lower limit.

Table 25. Stratified mean number per tow (untransformed) for northern searobin length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

	SPRING					AUTUMN				
	Regions									
	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4						1.202				
5						1.447				
6						38.157	.048	.289		
7						36.621	.143	.211		
8						21.704	.144	.148		
9						5.402	.479			
10						.175	.096			
11	.109					1.249	.096		.086	
12	.388		.205			.046				
13	1.940	.048	.913			.109			.045	
14	2.634	.286	2.305						.082	
15	2.683	.476	2.949						.052	
16	1.361	.862	2.197			.046				
17	.351	.767	.396							
18	.224	.096	.345			.060	.048			
19	1.385	9.346	.704			.273				
20	5.188	18.401	2.301	.035		.743	.048			
21	7.244	69.377	3.275	.041		.227				
22	7.416	86.129	2.884			.167		.071		
23	5.238	69.927	3.608			.740		.283		.046
24	4.963	57.562	1.498			.301	.048	.353	.082	
25	2.467	32.250	1.421			.492	.239	.330	.166	
26	2.294	35.860	1.184	.041		.806	.427	.072		.027
27	3.558	61.974	.788	.038		1.300	.332	.330	.166	
28	1.613	61.617	.543	.035		.936	.190		.045	.084
29	1.831	65.043	.589	.038		.557	.333	.043		
30		37.348	1.115	.070		1.068	.047		.045	
31	.944	17.333	.436	.038		1.038	.143			
32	.164	13.798	.064	.076		.775	.143			
33	.109	3.201	.154			.279	.048			
34	.056	4.418				.155		.064		
35		1.145	.064			.093				
36	.390	.142								
37		.048								
38		.142								
39										
40										
41										
42										
43										
44										
45										
46										
47										
[illegible]										
	54.550	647.593	29.939	0.413		116.168	3.051	2.194	0.769	0.157
	21.90	25.26	20.90	27.78		8.69	21.22	19.78	21.69	26.19

Table 26. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of longhorn sculpin for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	2.30	1.55-3.04	11.93	7.86-15.99	0.19
1979	2.63	1.79-3.48	17.91	10.04-25.78	0.15
1980	1.89	1.43-2.35	12.10	8.64-15.56	0.16
1981	6.08	4.00-8.15	38.67	23.88-53.47	0.16
AUTUMN					
1978	0.26	0.12-0.41	4.09	1.43- 6.74	0.06
1979	1.08	0.61-1.54	10.03	5.57-14.49	0.11
1980	1.21	0.49-1.92	14.49	5.99-23.00	0.08
1981	0.70	0.33-1.06	4.64	2.15- 7.13	0.15

* Negative lower limit.

47. Stratified mean number per tow (untransformed) for longhorn sculpin length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

	SPRING					AUTUMN				
	Regions									
	1	2	3	4	5	1	2	3	4	5
2										
3										
4										
5										
6					.070					
7										
8					.140					
9			.043	.086	.539					
10				.298	1.126					
11				.708	.419					
12				.709	.815					
13			.072	.706	.492					.111
14				.632	.840				.152	.084
15	.060	.048		.622	1.870				.122	.111
16				.849	4.960				.361	
17				1.266	5.973				.244	
18				2.599	7.493				.070	.084
19				4.718	9.483				.035	.299
20	.022			6.065	6.987					1.705
21	.213		.136	6.012	4.456			.043	.076	3.532
22	.557		.328	4.587	4.098				.271	2.739
23	.989		.810	3.599	3.562				.326	1.957
24	1.295	.048	.679	2.859	5.544				.191	1.381
25	1.049	.047	3.051	3.833	7.915				.140	1.645
26	.574	.144	3.578	3.790	8.016				.146	1.567
27	.290	.048	2.353	3.628	6.220				.097	1.381
28	.066	.095	1.924	3.619	6.046				.115	.908
29	.186	.239	1.550	3.180	3.689				.035	.634
30	.180	.096	1.405	2.566	3.304				.035	.312
31	.120	.048	.345	1.100	.508				.035	.130
32	.082		.691	.854	.669					.130
33	.022		.191	.279	.185					.046
34	.060	.048	.107	.224	.047					
35			.064	.086						
36				.041	.070					
37				.041						
38				.121						
39				.079						
40										
41										
42										
43				.041						
44										
45										
46										
47										
48										
	5.765	0.861	17.328	59.797	95.538			0.043	2.452	18.755
	24.74	27.50	26.84	23.00	22.08			21.00	21.11	23.47

Table 28. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of Yellowtail flounder for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	6.09	3.62 - 8.56	22.83	12.55 - 33.11	0.27
1979	6.90	4.93 - 8.86	26.42	18.87 - 33.96	0.26
1980	6.01	4.54 - 7.48	19.70	14.55 - 24.85	0.30
1981	9.81	7.34 - 12.27	46.52	31.12 - 61.93	0.21

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	1.68	0.91 - 2.46	9.95	6.72 - 13.17	0.17
1979	4.47	2.86 - 6.08	29.27	17.92 - 40.63	0.15
1980	3.55	2.42 - 4.67	24.75	16.66 - 32.83	0.14
1981	1.65	0.70 - 2.60	6.83	4.15 - 9.52	0.24

* Negative lower limit.

Table 29. Stratified mean number per tow (untransformed) for Yellowtail flounder length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

	SPRING					AUTUMN				
	Regions									
gth n)	1	2	3	4	5	1	2	3	4	5
1										
2										
3				.041						
4										
5										
6										
7				.497						
8				.038	.094					
9			.145	.229	.283					
10			.678	.599	.683					
11			.597	.599	.755					
12			.475	.446	.542					
13		.047	.464	.336	.223					
14			.548	.114	.493					.04
15			1.095	.156	.705			.580	.052	
16			2.167	.392	.518			.130	.103	.09
17			1.401	.632	.961			.145		.04
18			1.137	1.360	2.564			.188	.133	.25
19	.060	.048	1.679	1.656	3.672				.296	.09
20			1.891	3.281	4.516			.623	.407	.29
21			1.836	3.839	7.120			.435	.530	.21
22			1.580	4.972	8.200			1.058	.337	.17
23			2.422	6.161	10.335			1.085	.243	.25
24			1.909	5.964	10.638			1.346	.413	.14
25			2.854	5.988	8.367			.812	.197	.23
26			2.728	5.701	5.309			2.303	.410	.61
27			3.325	5.843	3.565			1.866	.254	.59
28			2.784	4.584	2.908			1.058	.535	.80
29	.060		3.632	4.663	1.398			.884	.874	1.16
30	.055		2.144	4.221	3.386			.824	.798	.79
31	.082		2.343	1.821	2.004			.621	.503	.94
32	.115		2.742	1.529	2.042			.114	.660	1.04
33			1.121	.811	1.923			.145	.565	.59
34			0.445	.857	2.005			.433	.217	.27
35			1.055	1.151	2.351			.303	.127	.29
36			0.846	1.140	2.409			.145	.045	.48
37			1.204	.707	2.758			.145	.217	.13
38			.268	.471	1.752					.80
39			.440	.659	1.397			.145	.045	.61
40			.474	.484	1.850			.145		.28
41			.426	.144	.774					.08
42			.064	.383	.328					
43			.072	.170	.259			.087	.045	.25
44			.145		.961					.08
45				.041	.471			.145	.045	
46			.290		.398					.08
47				.045						.16
48				.086	.188					.16
l ngth										

Table 29. (Cont.)

	SPRING					AUTUMN				
	Regions									
gth m)	1	2	3	4	5	1	2	3	4	5
9					.140			.043		.046
5				.168	.070					
1										
2			.072							
3										
4										
5					.094					
6										
7										
8										
9										
6										
1										
2										
3										
4										
5										
6										
7										
8										
9										
7										
1										
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4										
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7										
8										
9										
8										
1										
2										
3										
4										
5										
6										
7										
	0.372	0.095	49.499	72.982	101.410			15.808	8.051	12.198
gth	28.90	16.02	25.68	25.61	26.17			26.36	27.56	31.29

Table 30. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of winter flounder for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
			SPRING		
1978	18.70	12.80-24.60	62.74	47.50-77.97	0.30
1979	16.56	11.13-21.98	58.85	42.36-75.34	0.28
1980	16.23	11.93-20.54	51.34	41.47-61.21	0.32
1981	21.50	13.51-29.48	70.86	49.53-92.18	0.30
			AUTUMN		
1978	5.46	3.47- 7.46	25.47	15.82-35.13	0.21
1979	13.68	9.13-18.22	54.26	36.95-71.58	0.25
1980	6.92	4.47- 9.37	30.74	20.84-40.64	0.23
1981	6.36	4.39- 8.33	22.51	15.37-29.66	0.28

* Negative lower limit.

Stratified mean number per tow (untransformed) for winter flounder length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

h	SPRING 1	SPRING 2	SPRING 3	SPRING 4	SPRING 5	AUTUMN 1	AUTUMN 2	AUTUMN 3	AUTUMN 4	AUTUMN 5
7				.086					.103	
	1.169			.121					.103	
	1.996			.802	.047					
	1.875	.382		2.190	.288				.038	
11	1.121	1.197	.283	2.685	.923					
12	2.307	2.531		3.304	1.999	.062		.064		
13	2.984	2.582		3.492	2.548					
14	1.743	1.668	1.561	2.833	2.564			.128	.052	.063
15	.717	1.622	1.526	1.713	2.801	.022			.359	.385
	.821	1.521	.551	1.451	2.971	.046			.535	.920
	1.258	.902	.924	1.678	4.182	.196	.048		.483	1.414
	1.341	.999	.205	1.286	4.272	.104			1.588	1.690
	1.850	.379	.437	1.197	6.160	.022	.047		2.848	1.102
	1.504	.764	.346	3.484	6.762	.022	.048		3.368	2.377
21	1.621	.665	.486	2.513	5.025	.112	.048		2.520	2.836
22	1.647	.427	.339	3.391	5.001	.153			3.000	3.778
23	1.336	.860	1.334	3.521	5.110	.066			2.149	4.088
	1.580	1.049	1.207	4.000	4.461			.064	2.267	2.167
	2.183	1.289	1.025	4.089	3.328	.270			3.162	2.616
	2.021	1.194	.561	3.153	3.869	.227			3.141	2.313
	2.695	1.475	.642	2.942	2.283	.451	.047		4.224	2.191
	2.749	1.101	1.549	4.257	3.044	.180	.095	.211	4.252	1.668
	1.991	1.386	3.153	3.176	6.019	.205		.282	3.754	1.158
	2.564	1.532	2.588	5.610	7.709	.093		.339	3.739	2.193
	1.756	1.570	2.326	3.622	4.275	.161	.095	.043	2.020	1.722
	1.825	1.858	1.177	4.491	7.930	.208		.185	1.780	2.323
	1.995	1.477	1.915	3.939	5.577	.161		.255	1.365	1.862
	1.449	1.904	2.535	3.477	2.546	.139	.096	.114	.853	1.781
	1.774	1.568	1.064	2.739	3.766	.139			.461	.964
	1.395	1.998	2.362	3.087	2.731	.068			.409	1.085
	1.086	1.857	1.654	1.798	.815	.022		.043	.399	.660
	1.545	1.095	.551	1.238	1.586				.312	.382
	.670	1.097	.481	.617	.921			.141		.448
	.923	.999	1.173	.525	.510				.073	.258
	.583	.618	.770	.238					.141	
	.169	.429	.148	.175	.047			.072		.084
	.115	.380		.175	.402			.043	.038	
	.197	.190		.172	.178				.038	.210
	.055	.096	.360		.259			.043		
	.060	.048	.461	.041					.052	
		.048								.084
	.022	.047	.249							

th

Table 31. (Cont.)

	SPRING					AUTUMN				
	Regions									
th)	1	2	3	4	5	1	2	3	4	5
9	.060		.283							
5	.022	.047	.043	.082						
1										
2			.283					.043		
3										
4										
5										
6										
7			.077							
8		.048	.071							
9										
6										
1										
2										
3										
4										
5										
6										
7										
8										
9										
70										
1										
2										
3										
4										
5										
6										
7										
8										
9										
80										
1										
2										
3										
4										
5										
6										
7										
	56.773	42.900	36.695	89.390	112.912	3.130	0.523	2.073	49.625	44.920
gth	24.16	26.17	29.81	24.99	25.20	26.69	26.36	30.95	25.75	26.10

Table 32. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of summer flounder for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
			SPRING		
1978	1.20	0.54-1.86	1.17	0.32-2.03	1.02
1979	0.61	0.26-0.95	0.37	0.15-0.60	1.63
1980	0.62	0.36-0.88	0.36	0.22-0.50	1.71
1981	1.04	0.55-1.55	1.19	0.43-1.96	0.87
			AUTUMN		
1978	0.83	0.51-1.16	0.55	0.33-0.78	1.51
1979	0.26	0.04-0.49	0.17	0.02-0.32	1.58
1980	0.71	0.40-1.02	0.50	0.25-0.75	1.41
1981	0.63	0.36-0.89	0.77	0.44-1.10	0.81

* Negative lower limit.

Table 33. Stratified mean number per tow (untransformed) for summer flounder length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

	SPRING					AUTUMN				
	Regions									
	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11	.055									
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24	.060									
25										
26										
27	.055	.047								
28	.219					.046				
29	.275									
30	.277	.142								
31	.109			.045						
32	.269	.047				.022				
33	.115	.095								
34	.242	.047				.093				
35	.060					.046		.077		
36	.082	.095	.064			.191				
37	.131	.142				.306	.047			
38	.440	.047				.259		.077		
39	.164	.096				.311	.047			
40	.329	.047	.071			.422	.096			
41	.501	.095				.379				
42	.055		.141			.177	.047	.154		
43	.055	.047				.046		.154		
44		.047				.060	.048		.045	
45	.060					.084				
46			.205			.218	.047	.077		
47						.044				
		.048				.022			.052	
th										

Table 33. (Cont.)

	SPRING					AUTUMN				
	Regions									
gth)	1	2	3	4	5	1	2	3	4	5
9			.077			.022	.047			
50	.055							.077		
1	.056	.047				.084				
2		.048	.064							
3						.062				
4	.060									
5	.055	.047	.064							
6		.095								
7	.110									
8						.022				
9										
60									.052	
1								.064		
2										
3		.047								
4	.055	.048								
5			.077							
6										
7										
8										
9										
70										
1	.056									
2		.047								
3										
4	.055									
5										
6										
7										
8										
9										
80										
1										
2										
3										
4										
5										
6										
7										
8										
1	4.051	1.423	0.762	0.045		2.918	0.380	0.680	0.148	
ngth	37.91	42.47	47.35	31.00		40.56	42.12	44.12	50.95	

Table 34. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of American plaice for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	1.81	1.05-2.56	20.39	6.77- 34.01	0.09
1979	4.00	3.44-4.56	51.28	39.04- 63.53	0.08
1980	5.17	3.97-6.37	88.33	60.69-115.97	0.06
1981	6.97	4.74-9.20	73.46	40.62-106.29	0.10

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	2.96	1.83-4.09	59.79	29.58-90.01	0.05
1979	1.42	0.70-2.14	16.63	9.02-24.24	0.09
1980	2.91	2.01-3.81	36.95	23.83-50.06	0.08
1981	1.64	0.59-2.69	14.21	4.78-23.64	0.12

* Negative lower limit.

Stratified mean number per tow (untransformed) for American plaice length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

	SPRING					AUTUMN				
	Regions									
h	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5										
6										
7				.041	.280					
8				.211	.910					
9				.994	1.893					
10				1.110	2.185				.052	
11				1.044	.420					.107
12				1.331	.700				.070	.612
13					3.533				.296	.585
14				.362	11.880				.306	.896
15				1.775	24.001				.306	.497
16				5.647	30.734				.347	.444
17				7.279	32.979				.138	.728
18				8.154	24.747				.354	1.460
19			.072	7.575	17.459				.608	3.061
20			.072	6.210	20.401				.868	3.171
21				3.159	14.632				1.484	3.930
22				1.768	15.596				1.733	7.722
23				1.699	13.685				2.148	4.515
24				2.720	8.564				1.661	5.495
25				1.325	6.052				1.195	5.580
26				2.566	6.381				.908	2.622
27				2.771	3.495				.549	1.424
28				1.757	5.242				.389	1.517
29				2.329	2.443				.338	.998
30				1.446	2.466				.301	.359
31				1.787	.892				.572	.741
32				.436	1.053				.363	.444
33				.753	.804				.261	.279
34				.251	1.600				.336	.191
35				.346	.712				.045	.297
36				.201	.941				.175	.053
37				.242	.821				.080	.053
38				.246	.829					.107
39				.070	.734					.053
40				.111	1.834					.080
41					.351					.053
42					.140					.107
43					.430					
44				.070	.711					.027
45				.115	.281					
46				.041	.351					
47					.421					
48					.070					
th										

Table 35. (Cont.)

th	SPRING					AUTUMN				
	Regions									
)	1	2	3	4	5	1	2	3	4	5
9										.084
50					.832					
1					.046					
2										
3					.291					
4					.070					
5					.046					
6					.046					
7										
8										
9										
60					.070					
1										
2										
3										
4					.070					
5										
6										
7										
8										
9										
70										
1										
2										
3										
4										
5										
6										
7										
8										
9										
80										
1										
2										
3										
4										
5										
6										
7										
8										
			.145	67.942	265.126				15.884	48.292
gth			19.50	20.79	20.02				23.55	22.95

Table 36. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of witch flounder for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	0.99	0.48-1.49	1.37	0.74-1.99	0.72
1979	0.64	0.15-1.12	0.62	0.19-1.05	1.03
1980	0.65	* -1.43	0.68	* -1.45	0.97
1981	1.46	* -3.23	1.71	* -3.50	0.85
AUTUMN					
1978	1.07	0.35-1.80	1.07	0.46-1.67	1.01
1979	0.50	* -1.03	0.63	* -1.32	0.79
1980	0.83	0.12-1.54	0.77	0.14-1.40	1.07
1981	0.11	* -0.25	0.16	* -0.41	0.65

* Negative lower limit.

Stratified mean number per tow (untransformed) for witch flounder length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

	SPRING					AUTUMN				
	Regions									
	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5										
6										
7										
8					.080					
9					.040					
10										
11										
12										
13										
14										
15										
16					.080					
17					.120					
18					.080					
19					.240					
20					.080					
21					.240					
22					.040					
23										
24				.035						.027
25										.027
26										.027
27										.027
28										
29										
30					.070					
31					.140					
32										.027
33										.027
34										
35										.027
36										.027
37				.045						.027
38					.211					
39										.027
40					.632					.111
41					.070					
42					.421					
43				.090	.321					.027
44				.045	.391					
45					.351					.080
46				.086	.351					.053
47				.045	.110					
48				.122	.281					

Table 37. (Cont.)

	SPRING					AUTUMN				
	Regions									
	1	2	3	4	5	1	2	3	4	5
9				.090	.070					.053
50					.632					
1				.045	.281					
2				.045	.070					
3			.072	.086	.297					.027
4				.041	.070					
5				.045	.469					
6										.084
7				.045	.070					
8					.140					
9										
60				.045	.351					.053
1										
2										
3										
4										
5					.070					
6										
7										
8										
9										
70										
1										
2										
3										
4										
5										
6										
7										
8										
9										
80										
1										
2										
3										
4										
5										
6										
7										
8										
			0.072	0.912	6.869					0.754
th			53.00	48.17	43.06					42.25

Table 38. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of windowpane for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1982.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	9.08	6.08-12.09	31.48	21.12-41.85	0.29
1979	8.46	5.42-11.50	30.12	19.78-40.47	0.28
1980	8.36	4.91-11.81	28.28	16.78-39.77	0.30
1981	11.12	6.90-15.34	36.83	22.43-51.23	0.30

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	0.98	0.53- 1.42	5.26	2.49- 8.03	0.19
1979	1.91	1.19- 2.63	8.49	5.59-11.39	0.22
1980	1.64	1.02- 2.27	7.60	4.75-10.44	0.22
1981	1.09	0.51- 1.68	7.78	2.67-12.89	0.14

* Negative lower limit.

Table [illegible]. Stratified mean number per tow (untransformed) for windowpane length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

	SPRING					AUTUMN				
	Regions									
h	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4						.093				
5						.046		.064		
6	.055	.095				.372	.047			
7	.109	.047	.638			1.525		.064		
8	.220	.096	.638			.713				
9						.404				
10						4.294				
11	.111					1.968			.052	.050
12	.055		.416		.050	1.625				
13	.232	.096	.289	.052		1.718		.077	.052	.109
14	.165	.191			.224	.844		.231	.041	.504
15	.295	.096	1.940	.090	.165	.109		.308	.041	.315
16	.236	.048	.595	.221	.510	.107		.077	.163	.126
17	.317	.096	.679	.169	.413	.128	.047	.077	.045	.189
18	.181	.047	.701	.200	.094	.107		.372		
19	.351	.048	.977	.079	.189	.046		.345		
20	.270	.142	2.581	.082		.529		.998	.092	
21	1.602	.143	3.735		.047	.486		1.183		.046
22	.440	.142	4.907	.038		.578		1.405	.041	
23	.562	.997	4.936	.172	.119	.399		1.975	.193	
24	.682	1.331	5.980	.399	.218	.227	.047	1.969		.298
25	1.356	1.908	6.994	.712	.377	.608	.096	2.395	.090	.483
26	1.689	5.139	7.086	.668	.409	.425	.048	2.490	.220	.119
27	1.776	7.580	12.691	.696	.590	.652	.191	2.047	.038	.298
28	1.725	10.809	10.197	.576	.546	.260	.240	.845	.124	.099
29	1.075	9.955	5.576	.410	.485	.169	.096	.295	.038	.149
30	1.057	11.592	6.761	.465	.407	.273	.047	.332	.052	.059
31	.565	7.429	3.749	.221	.228	.060	.190	.349	.079	.050
32	.605	7.966	4.448	.270	.253	.060	.096	.576	.038	
33	.319	5.579	2.550	.207	.149	.046	.142	.231		.159
34	.078	3.623	1.764	.128	.097	.155	.048	.286		
35	.243	3.157	.859	.090	.099	.060				
36	.165	1.908	.661		.050			.043		
37		1.666	.715			.046	.047	.145		
38	.022	.238	.539			.107				.084
39		.096						.064		
40		.431	.077							
41		.048	.212		.047					
42		.144								
43		.144	.077							
44								.145		
45										
46										
47										
48										
l	16.557	83.028	93.966	5.943	5.764	19.239	1.384	19.387	1.398	3.135
th	25.00	29.84	26.23	26.12	24.93	14.57	28.18	24.67	22.73	22.05

Table 40. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of Atlantic herring for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	0.29	* -0.69	34.56	* -91.11	0.01
1979	0.67	* -1.36	17.35	0.35-34.35	0.04
1980	0.63	0.06-1.21	14.89	* -32.17	0.04
1981	0.37	0.04-0.70	5.66	* -13.55	0.07
			AUTUMN		
1978	0.41	0.03-0.80	8.51	* -17.18	0.05
1979	0.03	* -0.07	5.36	* -15.29	0.01
1980	0.10	0.01-0.19	1.49	0.31- 2.67	0.07
1981	0.09	0.01-0.18	1.09	0.00- 2.18	0.09

* Negative lower limit.

Table 41. Stratified mean number per tow (untransformed) for Atlantic herring length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

	SPRING					AUTUMN				
	Regions									
k th)	1	2	3	4	5	1	2	3	4	5
3										
4										
5										
6										
7					.070					
8					.211					
9										
10				.041	.070			.064		
11										
12					.425	.046			.041	.084
13					2.478		.047			.027
14				.121	9.702					
15					5.689				.086	
16					.803				.086	
17									.045	
18					.070				.226	
19									1.536	
20					.140				1.712	
21					.351				.226	
22	.060			.041	.211				.045	
23				.082	.702				.045	
24					.621					
25					1.058				.045	
26					.930				.090	
27					.880				.136	
28					.490				.045	
29					.340					
30					.370					
31					.080					
32				.035	.040					
33					.080					
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										
L	0.060			0.321	25.812	0.046	0.047	0.064	4.364	0.111
ıgth	22.00			18.80	16.92	12.00	13.00	10.00	19.84	12.24

Table 42. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of butterfish for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	0.16	* -0.34	1.14	* - 2.34	0.14
1979	0.02	* -0.06	0.28	* - 0.67	0.08
1980	0.38	* -0.87	5.46	* - 11.02	0.07
1981	0.11	* -0.28	0.99	* - 2.40	0.11

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	1.42	0.95-1.89	132.68	85.97-179.40	0.01
1979	0.89	0.62-1.16	74.55	51.58- 97.51	0.01
1980	4.61	1.99-7.23	418.75	177.91-659.59	0.01
1981	2.38	1.53-3.22	102.78	66.14-139.14	0.02

* Negative lower limit.

[illegible] Stratified mean number per tow (untransformed) for butterfish length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

h	SPRING					AUTUMN				
	Regions									
	1	2	3	4	5	1	2	3	4	5
1							.048			
2						.093	.096	1.205		
3						.046	.144	12.552		
4						.186	.144	22.960	.296	.415
5						.730	.284	24.100	.687	1.117
6	.111					4.907	2.203	6.833	1.921	2.961
7	.164		.077			13.437	4.122	9.670	3.867	.709
8	.115					47.001	25.212	9.268	3.243	
9						56.326	55.731	2.829	2.758	
10						27.888	45.023	1.228	7.056	
11	.055				.046	5.941	6.829	1.206	12.943	
12	.290					1.556	3.915	.478	13.391	
13				.041		.655	.095	.043	23.625	
14	.060					.139			33.629	
15	.022					1.579			9.792	
16	.361								.361	
17	1.099								.206	
18	1.434								.125	
19	.884								.171	
20	.296					.503			.125	
21	.120								.045	
22									.271	
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										
	5.011		0.077	0.041	.046	160.987	143.845	92.371	114.512	5.203
t	16.66		7.00	13.00	11.00	8.81	9.19	5.33	12.37	5.76

Table 44. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of sand lance for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
SPRING					
1978	2.80	* -6.05	243.32	* -509.45	0.01
1979	0.88	* -2.14	117.65	* -274.21	0.01
1980	1.90	* -4.34	202.88	* -506.07	0.01
1981	2.13	0.85-3.42	233.16	107.40-358.93	0.01
AUTUMN					
1978	0.10	* -0.22	26.35	* - 64.77	0.00
1979	0.06	* -0.16	12.46	* - 33.23	0.00
1980	0.03	* -0.07	4.83	* - 11.26	0.01
1981	0.03	* -0.07	6.06	* - 14.00	0.00

* Negative lower limit.

Table 45. Stratified mean number per tow (untransformed) for sand lance length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

	SPRING					AUTUMN				
	Regions									
gth n)	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4			.077							
5	.278									
6		.048								
7		.190	.077							
8		.095					.334	1.001		
9	.056	.473					2.681			
10	.167	1.749	3.479	1.701			6.274	1.500		
11	.111	2.649	26.456	11.526			7.092	.499		
12		7.013	126.567	14.227			2.779	1.339		
13		9.472	286.797	23.063	.047		.192	2.540		
14	.056	2.889	324.998	24.125				2.359		
15	.056	1.899	242.496	13.564	.142		.192	.829		
16		1.329	199.936	4.624	.189			.829		
17		.666	92.123	1.051	.236			1.339	.038	
18		.570	52.383					.191		
19		.190	33.888		.142			1.020		
20	.056	.239	7.188	.412						
21		.048	10.400		.047					
22		.048	3.772							
23		.048	3.598							
24			.212		.047					
25										
26			.212							
27			.212							
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										
	0.779	29.613	1414.870	94.293	0.850		19.543	13.447	0.038	
gth	9.65	12.96	14.60	13.32	17.17		10.55	13.53	17.00	

Table 46. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of spiny dogfish for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	23.57	* - 47.69	11.24	* - 27.40	2.10
1979	6.41	3.38- 9.44	1.85	0.80- 2.92	3.45
1980	6.14	2.15- 10.14	1.70	0.51- 2.89	3.62
1981	6.90	0.59- 13.20	1.55	0.05- 3.06	4.44

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	229.71	48.56-410.85	151.71	28.29-275.12	1.51
1979	40.17	6.17- 74.17	12.55	3.49- 21.62	3.20
1980	18.55	* - 46.75	4.96	* - 12.49	3.74
1981	46.37	* -104.17	11.57	* - 25.88	4.01

* Negative lower limit.

Table 47. Stratified mean number per tow (untransformed) for spiny dogfish length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

Regions

ngth cm)	SPRING					AUTUMN				
	1	2	3	4	5	1	2	3	4	5
9										
50										
1										
2										
3										
4										
5										
6										
7										
8										
9										
60										
1										
2										
3										
4										
5										.027
6										
7										.027
8								1.272		
9								1.996		
70								1.449		.046
1								0.304		
2										
3								1.754		
4								0.304		
5										0.182
6								2.301		0.046
7								1.272		0.092
8								0.304		0.153
9								1.272		0.126
80								0.304		
1										
2										
3										.109
4								1.029	.035	
5								1.638		
6			.290							
7	.055								.035	
8			.130					4.190	.035	
l ngth										

Table 47. (Cont.)

	SPRING					AUTUMN				
	Regions									
	1	2	3	4	5	1	2	3	4	5
9	.055		.333					5.766	.070	
90	.060		.404					3.822	.105	.063
1	.056		.201					2.185		
2	.170		.652					2.489	.070	
3	.284		.130					7.216	.070	
4	.060		.290					8.549	.035	.046
5	.115		.591					5.158	.105	.063
6	.164	.047	.528					5.882	.035	
7	.055		.333					2.721	.105	
8	.115	.142	1.200					3.822	.035	
9	.142	.047	.910					1.996	.080	
100	.175	.190	.548					2.301	.070	
1	.115	.095	.043							
2	.055	.047	.141					1.272		
3	.115	.047	.333							
4								1.754		
5								2.246		
6	.055									
7		.047								
8			.290							
9										
110										
1										
2										
3										
4										
5										
6										
7										
8										
9										
20								0.725		
1										
2										
3										
4										
5										
6										
7										
8										
1	1.844	.664	7.349					77.293	0.887	0.978
nth	96.21	100.21	96.09					90.94	93.62	79.53

Table 48. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of little skate for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	14.10	6.74-21.46	32.09	9.48-54.71	0.44
1979	18.22	12.58-23.85	38.11	24.65-51.57	0.48
1980	11.93	7.88-15.98	25.83	16.51-35.16	0.46
1981	26.94	19.63-34.26	54.58	38.78-70.37	0.49

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	6.43	4.46- 8.41	11.21	7.75-14.67	0.57
1979	15.28	10.70-19.86	28.87	19.90-37.84	0.53
1980	13.82	8.96-18.67	27.59	16.06-39.11	0.50
1981	7.31	4.60-10.02	13.28	7.75-18.81	0.55

* Negative lower limit.

Table 49. Stratified mean number per tow (untransformed) for little skate length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

	SPRING					AUTUMN				
	Regions									
th)	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5										
6										
7										
8										
9						.781				
10										
11				.038						
12				.076						
13				.324		.781				
14				.156						
15		.048		.200						
16	.060	.048	.308	.197						
17			.308	.273						
18	.240			.076	.109				.038	.050
19	.169			.197					.052	
20	.060			.166					.052	
21	.109	.047	.154	.224						.063
22	.230	.047	.372	.169		.062			.206	.063
23	.388		.449	.378	.168	.107			.052	
24	.831		.422	.479	.050	.062		.071		.063
25	1.345	.048	1.107	.636	.109	.125				
26	1.691	.142	.858	.839	.308	.062			.103	
27	2.388	.048	1.282	.944	.109	.060	.048	.064	.052	.084
28	2.960		.969	1.009	.218				.141	
29	3.178	.143	1.817	1.096	.168	.250		.064	.052	.063
30	3.170	.142	1.447	1.122	.476	.574	.048		.103	
31	4.074	.239	1.025	.663	.208	.479	.192		.141	
32	6.243	.525	1.314	.841	.258	.706	.047	.077	.092	.063
33	5.527	.764	.908	.520	.149	.387	.095	.071	.195	
34	5.283	1.051	.757	.742	.357	.653	.047		.128	.050
35	3.506	1.149	.974	1.264	.466	.481	.143		.083	
36	5.215	1.003	.781	.363	.159	1.244	.047		.128	.063
37	5.849	1.005	.942	.500	.317	1.042		.071	.076	.172
38	2.995	.669	.717	.448	.218	.711	.095		.090	
39	5.610	.908	.409	.664	.099	1.353	.143		.247	
40	4.424	1.339	1.351	.835	.407	.973	.143		.182	.059
41	6.791	.812	.473	.870	.178	1.164			.038	.099
42	4.723	1.960	1.122	.935	.159	1.787	.096	.217	.114	.208
43	5.127	1.671	1.184	1.284	.168	2.940	.048	.225	.182	.113
44	9.172	3.008	1.850	1.247	.317	3.596	.048	.426	.103	.149
45	14.731	4.099	2.555	.936	.059	5.742	.190	.497	.114	
46	16.340	4.863	2.964	1.233	.109	8.105	.477	.607	.052	
47	12.369	4.668	3.450	1.973	.367	7.124	.192	.998	.052	
48	9.172	4.244	1.630	1.967		6.064	.524	.473	.345	.109
th										

Table 49. (Cont.)

	SPRING					AUTUMN				
	Regions									
ngth cm)	1	2	3	4	5	1	2	3	4	5
9	6.580	2.764	2.043	2.528	.393	3.180	.142	.295	.234	.218
50	2.404	2.285	2.655	3.112	.317	1.862	.096	.269	.280	.113
1	.849	.569	.268	2.168	.315	.109	.095	.359	.464	.109
2	.297	.523	.276	1.857	.268	.187	.048		.487	.050
3	.111	.332	.077	1.438	.168	.171			.345	.165
4			.064	.546	.225			.071	.234	.113
5				.234	.272					.178
6				.159						
7		.095		.038	.094	.125				
8										.046
9										.059
60										
1					.047					
2										
3										
4										
5										
6										
7										
8										
9										
70										
1										
2										
3										
4										
5										
6										
7										
8										
9										
80										
1										
2										
3										
4										
5										
6										
7										
8										
tl	154.213	41.260	39.281	37.966	7.810	53.054	3.004	4.854	5.256	2.520
Length	40.38	43.90	39.02	40.61	39.61	43.16	42.78	45.36	41.93	43.08

Table 50. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of winter skate for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
SPRING					
1978	12.92	8.04-17.80	4.57	2.57- 6.57	2.83
1979	15.62	9.07-22.18	5.45	3.21- 7.68	2.87
1980	15.96	10.95-20.96	9.52	5.58-13.47	1.68
1981	44.30	32.61-55.99	39.60	28.40-50.80	1.12
AUTUMN					
1978	7.86	2.09-13.63	3.96	1.90- 6.01	1.99
1979	10.60	7.17-14.04	5.56	3.77- 7.35	1.91
1980	15.96	6.53-24.42	8.60	5.50-11.71	1.80
1981	11.90	7.76-16.04	7.60	5.16-10.04	1.57

* Negative lower limit.

[illegible] Stratified mean number per tow (untransformed) for winter skate length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

	SPRING					AUTUMN				
	Regions									
	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13			.128							
14			.128							
15										
16										
17										
18										
19			.128							
20			.191							
21			.064							
22										
23			.191							
24			.255							
25			.255							
26			1.615					.141		
27			.786							
28			1.034					.191		
29			1.839					.128		
30			2.921			.046		.332		
31			3.822	.038			.048	.128		
32		.048	5.742	.041		.215		.255		
33	.109	.190	8.519	.038		.123		.255		
34	.120	.575	6.743	.076	.168	.289	.142	.191		
35	.262	.621	9.029	.114	.059	.218	.096	.473		
36	.505	1.385	4.270	.552	.099	.385	.048	.959		
37	.471	.957	9.451	.424	.159	.525	.143	.490		
38	.460	1.047	6.453	.514	.050	.368	.048	.416		
39	.254	1.002	7.679	.259		.398	.047	.513		
40	.278	2.294	11.054	.719	.159	.681	.095	.963		
41	.154	1.047	6.666	.308		.139	.095	.768		
42	.221	1.340	8.635	.282		.046	.190	.948		
43	.318	1.764	7.707	.090	.059	.169	.238	.902		
44	.377	1.430	7.070	.325		.246	.239	1.590		
45	.320	.952	9.529	.041		.246	.190	1.060		
46	.553	1.476	7.495	.269		.262	.047	1.854		
47	.578	.760	7.821	.090		.380	.191	1.583		
48	.188	1.096	5.473	.279	.094	.373		1.629		

Table 51. (Cont.)

ngth cm)	SPRING 1	SPRING 2	SPRING 3	SPRING 4	SPRING 5	AUTUMN 1	AUTUMN 2	AUTUMN 3	AUTUMN 4	AUTUMN 5
	Regions									
-										
9	.132	.857	2.729	.134		.294	.048	1.266		
50	.222	1.620	5.570	.406	.047	.153	.142	1.002		
1	.390	.473	3.380	.200	.047	.171	.096	.512		
2	.167	.618	2.763	.156	.047	.155	.048	.848	.052	
3	.279	.427	3.810	.355	.059	.373		.794		
4	.187	.473	3.159	.213	.096	.125	.096	.836		
5	.110	.381	3.764	.350	.144	.046		.853		
6	.110	.474	1.426	.155	.249	.046	.096	.744		
7	.078	.429	2.166	.103		.356	.095	.740		
8	.056	.286	2.205	.052	.107	.107		.959		
9	.111	.522	2.438		.059	.218	.048	.567		
60	.166	.712	2.115		.047	.373		.281		
1	.164	.238	1.631	.052	.119	.187		.426		
2	.110	.379	1.067	.052		.187		.486		
3		.378	.755			.062	.095	.491		
4	.221	.237	.672			.060	.096	.557		
5	.167	.142	.775			.218		.295		
6	.077	.095	.863			.107		.650		
7	.110	.189	.308					.486		
8	.167	.284	1.174			.060	.048	.507		
9	.110	.095	.353			.171		.294		
70	.056	.236	.710			.046		.282		
1	.056	.047	.319					.064		
2	.172	.189	.647			.093		.194		
3	.056	.095	.120					1.000		
4	.165	.095	.284					.198		
5	.056	.285	1.282					.642		
6	.055		.807			.062		.368		
7		.095	.136		.059			.231		
8	.165	.284	.211					.526		
9		.047	.794		.050	.109		.216		
80		.239	.782		.050			.207		
1	.060	.096	1.341			.046		.148		
2		.095	.686							
3	.055	.095	1.356			.046		.345		
4	.055		.387							
5	.167	.191	1.646			.109		.228		
6		.047	.695			.046				
7			.492		.109	.046		.174		
8		.047	.716							
gth										

Table 51. (Cont.)

	SPRING					AUTUMN				
	Regions									
	1	2	3	4	5	1	2	3	4	5
	.055	.190	.178							
9		.189	.843		.059			.151		
1		.048	.238			.046				.059
2			.214					.087		
3		.095	.659					.064		
4		.047	.134	.052				.222		.063
	.022	.286	.149					.294		
	.056	.047	.154							
7	.110	.095	.171					.151		
	.055	.048	.154							
	.055							.087		
10		.047						.433		
		.047	.128							
			.205					.217		
								.145		
1								.071		
1			.043							
2										
3										
5										
6										
7										
2										
1										
3										
5										
6										
7										
	9.772	30.611	202.496	6.738	2.196	9.234	2.766	36.105	0.052	0.122
h	52.53	50.24	46.13	44.86	53.28	49.50	46.11	55.26	52.00	92.54

Table 52. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of longfin squid for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	0.66	0.25-1.08	6.47	3.02- 9.93	0.10
1979	2.11	1.06-3.16	25.87	10.62- 41.12	0.08
1980	2.72	1.04-4.40	20.73	9.00- 32.46	0.13
1981	0.56	0.19-0.93	6.21	2.94- 9.48	0.09

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	4.18	2.93-5.43	560.33	15.07-1105.60	0.01
1979	2.66	1.70-3.62	362.34	194.15- 530.53	0.01
1980	3.12	2.26-3.97	265.44	199.10- 331.78	0.01
1981	3.68	2.96-4.41	284.80	207.44- 362.15	0.01

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* Negative lower limit.

Table 53. Stratified mean number per tow (untransformed) for Longfin squid length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

al le th)	SPRING					AUTUMN				
	Regions									
	1	2	3	4	5	1	2	3	4	5
1						8.331	10.106	.510	.367	
2	.167		.064			21.858	56.617	137.174	15.965	9.496
3	2.727	.096	.728			72.850	66.893	56.916	39.699	12.602
4	2.560	.571	2.641			65.617	41.829	34.476	27.301	14.222
5	.836	.475	1.148			36.915	38.653	28.643	26.589	24.652
6	.226	.331	.332			41.941	29.669	19.149	14.775	50.336
7	.055	.237	.128			51.581	34.244	12.108	20.539	40.916
8	.165	.095	.191			32.112	34.407	6.238	19.847	19.589
9	.221	.285	.128			21.577	20.207	3.523	19.082	9.881
10	.166	.237	.205			15.016	12.243	.587	14.429	2.824
11	.393	.095	.077			5.550	8.045	.886	7.743	1.755
12	.778	.333	.255			1.133	3.138	1.025	5.888	
13	.331	.905	.141			4.302	1.380	.077	2.373	
14	.388	.475	.295			.712	1.437		.604	
15	.656	.759	.128			.125	.379		.357	
16	.387	.709	.409			.046	.765		.849	
17	.166	.567				.060	.575		.052	
18	.111	.614	.231				1.486			
19	.111	.758					.815			
20	.111	1.041	.128				1.199			
21	.111	.426	.141			.046	.719			
22	.111	.426	.064				.527			
23		.427					.192			
24	.110	.425	.064				.096			
25	.111	.662	.077							
26		.236	.064			.082				
27	.111	.331				.022				
28		.615								
29	.111	.142	.064							
30		.332	.141							
31		.047	.077							
32	.111	.189	.077							
33		.236								
34	.111	.142								
35		.047								
36		.142								
37		.095								
38		.095								
39										
40		.047								
41										
42										
43										
44										
45										
46										
47										
48										
a	11.447	13.642	7.994			379.877	365.623	301.311	216.457	186.273
egth	8.92	18.58	8.96			5.47	5.40	3.44	6.08	6.00

Table 54. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of American lobster for all Massachusetts inshore strata sets, spring and autumn, 1976 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	1.09	0.59-1.59	3.17	1.71- 4.63	0.34
1979	0.82	0.31-1.33	2.34	0.61- 4.07	0.35
1980	1.16	0.61-1.71	3.56	1.49- 5.63	0.33
1981	2.77	0.63-4.91	10.07	1.40-18.73	0.28

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	2.46	1.02-3.89	10.01	2.96-17.06	0.25
1979	3.68	0.88-6.48	13.81	2.20-25.41	0.27
1980	1.56	1.16-1.95	4.97	4.00- 5.95	0.31
	1.98	0.86-3.09	7.40	2.75-12.04	0.27
1981	1.82	0.67-2.97	7.12	2.43-11.81	0.26

* Negative lower limit.

Table 55. Stratified mean number per tow (untransformed) for American lobster length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

	SPRING					AUTUMN				
	Regions									
	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11				.041						
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30					.086					
31										
32				.104						
33				.050						
34										
35										
36				.104						
37										
38										
39				.052	.086				.052	
40		.172			.107					
41										
42										.059
43		.086		.104	.058	.022				
44				.209	.349				.174	
45	.188	.086		.104	.132				.041	
46									.103	
47				.104	.132				.258	
48	.420	.086		.313	.539				.329	

Table 55. (Cont.)

	SPRING					AUTUMN				
	Regions									
gth n)	1	2	3	4	5	1	2	3	4	5
9					.132				.041	
50	.102			.209					.391	.126
1		.048							.206	.059
2		.086		.104	.560				.402	
3	.056			.209	.481	.062			.464	.046
4	.210	.257		.204	.765				.545	.298
5	.109	.048		.287	.658				.277	.185
6	.092	.086		.313	.132				.659	
7	.092	.086		.323	.238		.047		.597	.308
8	.300	.086		.259	1.555				.402	.059
9	.184	.048		.128	.395	.062			.597	.649
60	.280	.134		.354	1.053	.062			.505	.269
1	.102	.048		.079	.370		.048		.339	
2	.044	.086		.259	1.160			.064	.689	.399
3	.265	.047		.207	.920				.668	
4	.152			.224	.798				.855	.473
5		.086		.253	1.241				.618	.445
6	.092				.977				.762	.374
7	.566			.152	1.160				.487	.518
8	.184		.154	.510	2.319			.064	.857	.651
9				.156	.238			.064	.402	.554
70	.291			.156	.980				.601	.421
1	.286			.050	.765				.344	.185
2	.194			.057	.587				.584	.626
3	.184				1.364	.046	.048		.432	.424
4	.055			.307	.690				.554	.520
5			.085	.186	1.221				.384	.105
6	.286			.221	.744	.046			.466	.433
7				.399	1.049			.064	.713	.764
8	.184	.086		.378	1.513				.318	.564
9	.044			.189	.395				.352	.370
80	.055			.082	.776				.511	.273
1				.041	.107				.236	.109
2				.050	.559			.064	.277	.126
3	.102				.339				.193	.546
4					.185					.252
5		.172			.295				.052	.119
6				.041					.103	.189
7					.263				.144	.130
8			.077		.317				.041	
l ngth										

Table 55. (Cont.)

	SPRING					AUTUMN				
	Regions									
gth m)	1	2	3	4	5	1	2	3	4	5
9				.079	.309				.185	.211
90				.079	.107				.142	.407
1			.064		.198					.084
2			.077	.169	.237					
3		.086	.071	.076	.597					.059
4				.041	.281				.133	.126
5			.085		.107				.052	
6				.128						
7										
8			.071						.082	
9										
100								.077	.045	
1									.045	
2										
3										
4										
5										
6										
7										
8										
9										
110			.085		.107					
1										
2										
3										
4										
5										
6									.052	
7									.041	
8										
9										
120										.126
1										
2										
3										
4										
5										
6										
7										
8										
	5.118	1.917	0.768	8.143	30.726	0.302	0.143	0.396	18.798	12.644
th	63.67	59.23	87.79	63.95	68.77	61.57	63.70	77.12	66.54	72.18

Table 56. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of rock crab for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1981.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	1.39	0.51-2.27	22.16	5.25-39.06	0.06
1979	1.25	0.70-1.80	11.57	6.72-16.41	0.11
1980	0.78	0.34-1.23	6.21	3.42- 9.00	0.13
1981	2.10	1.42-2.78	18.74	11.60-25.88	0.11

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	3.36	2.35-4.37	43.74	22.68-64.81	0.08
1979	4.74	2.58-6.91	45.86	22.92-68.79	0.10
1980	4.14	3.17-5.11	55.60	28.67-82.53	0.07
1981	0.18	0.10-0.25	6.27	* -13.59	0.03

* Negative lower limit.

Table 37. Stratified mean number per tow (untransformed) for rock crab length frequency intervals for regions 1-5, Massachusetts inshore bottom trawl survey, spring and autumn, 1981.

	SPRING					AUTUMN				
	Regions									
th)	1	2	3	4	5	1	2	3	4	5
1						1.625				
2	.060	.048	.077			8.117				
3	.826	.575	.154	.038		9.798	.527	.372	.038	
4	.707	1.055	.141	.229		.543		.372		
5	1.875	1.917	.396	.811		1.251		.576		
6	6.011	2.918	1.033	2.025	.040	1.155		1.321	.309	
7	10.280	1.766	2.070	3.545	.357	.311		.989	.732	.449
8	7.219	1.861	3.595	5.269	1.018	.131		1.200	.662	.311
9	1.990	.954	3.289	5.635	1.782	.082		.444	.307	.139
10	1.254	.712	2.445	4.253	1.329	.235		.272	.079	
11	.680	.428	1.207	2.107	1.484	.153		.188	.288	
12	.273		.601	1.637	1.265			.217	.052	.084
13			.128	.871	.248				.079	
14				.279	.047					
15			.072							
16										
17										
18										
19										
20										
21										
22										
23										
24										
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47										
48										
l	31.175	12.234	15.207	26.740	7.571	23.402	0.527	5.952	2.545	0.984
th	7.11	6.60	8.54	8.95	9.99	3.02	3.00	6.94	8.15	8.03

Table 58. Average bottom temperature (°C) by depth interval and region, Massachusetts inshore bottom trawl surveys, spring and autumn, 1981.

SPRING
Depth (m)

Region	< 9.3	9.4-18.3	18.4-27.4	27.5-36.6	36.7-54.9	>55.0	Mean	Range
1	12.4	11.0	10.4	7.4			10.9	6.9-14.2
2	10.5	10.4					10.5	5.5-13.5
3	10.4	7.6	7.9	6.4	6.5		8.1	4.9-13.6
4	7.8	8.2	6.5	6.3	6.6	5.8	6.9	5.0-10.6
5	8.8	7.6	5.4	5.3	5.4	4.8	5.9	4.6- 9.1

AUTUMN
Depth (m)

Region	< 9.3	9.4-18.3	18.4-27.4	27.5-36.6	36.7-54.9	>55.0	Mean	Range
1	19.2	18.4	16.8	16.6			18.1	13.5-22.5
2	19.6	19.1					19.3	15.6-22.0
3	16.2	16.4	15.4	11.0	10.2		14.6	9.9-18.0
4	15.2	13.7	13.5	12.9	11.9	9.8	12.9	9.5-17.0
5	13.4	13.1	12.2	12.0	11.8	9.6	11.8	9.0-13.5

Job 2: Evaluation of winter flounder year-class success

INTRODUCTION

In order to effectively manage a resource and its fishery, it is desirable to assess spawning success and recruitment. Developing a timeseries of young-of-the-year (YOY) indices of abundance (IOA) may provide such an assessment.

Our methodology for collecting YOY abundance indices for winter flounder is based on knowledge of habitat and age-group behavior. Since YOY (0 age-group) are most abundant of fine-grained sediments in the estuarine littoral zone and move into the intertidal zone on a rising tide to feed (Tyler 1971), application of the following technique is considered appropriate.

Efforts to evolve beach seining methodology began in 1972. The survey commenced in 1975 and has continued with only one major change in effort, as described below, through 1983. In this report we present 1981 and 1982 seine IOA for winter flounder; however, no effort will be made to validate the seining technique. Validation will be detailed in the 1982 (Final) report.

REVIEW

In 1979, it was apparent that seine data, as then analyzed, did not reveal annual changes in year-class production because of broad confidence limits projected from standard deviations of seine indices. Alternative analysis techniques were investigated during 1980; post-stratification of the population's habitat in our study area (as used in stratified random sampling design) was ultimately undertaken to improve precision of the IOA. On the recommendation of reviewers of the 1980 report, an additional statistical term was incorporated into the reanalysis of the 1975-80 data as well as the 1981 and 1982 data reported herein.

In 1982, samples were allocated in proportion to the weight for each stratum, though actual selection of seine stations could not be truly random, due to restrictions of suitable bottom. In order to augment the number of stations in some estuaries, time and manpower constraints dictated that sampling of Buzzards Bay estuaries, where catches had always been relatively low, be eliminated.

Another consideration influencing selection of additional sample sites was the annual bycatch of brit (YOY) Atlantic herring occurring in the south shore estuaries which unexpectedly provided insight on stock abundance (Howe et al. 1983). These catches (as percent occurrence in tows) seemed to favorably compare with NMFS year-class size evaluations. Some expanded sampling on the south shore was therefore warranted in the hope that the seining survey could provide another indicatior of herring recruitment, even if it ultimately failed to fulfill that expectation for winter flounder recruitment.

METHODS

Assessment of winter flounder year-class strength was undertaken in six estuaries on the southern shore of Cape Cod. Recuritment from these estuaries is to inshore and offshore fisheries south and east of Cape Cod (Howe and Coates 1975) and has been identified as a major Massachusetts stock unit area (Pierce and Howe 1977).

Sampling techniques. The annual seine survey was conducted from mid-June to mid-July, the time of greatest YOY availability in the intertidal zone. Seining was restricted to the top half of the incoming tide when YOY were well distributed throughout the zone (Tyler 1971). At each station, three replicate tows, from a depth of 1.0-1.3 m and perpendicular to shore, were made with a 6.5 mm nylon mesh, 6 m straight seine equipped with a weighted lead line footrope to minimize escapement. Area swept was estimated by multiplying seine spread (maintained at 5.5 m with a taut spreader rope) by seining distance (measured by pace).

Sampling site selection was dictated by local conditions. Areas with substratum suitable for efficient seining (i.e., regions of < 0.5 m tidal amplitude and smooth intertidal bottom) were selected and sampled routinely each year. In most years, at least 99 seine hauls were made in southern Cape Cod estuaries.

YOY index. A computer program (YOYSTAT), written by DMF personnel, was used to calculate stratified mean catch per tow. Each data record is a station consisting of seine haul data pooled to create an individual observation (i.e., $y_{ij} = \#YOY/m^2$). A series of stations make up a stratum with each estuary being a different stratum. The estuaries' littoral perimeter (n mi) served as a weighting factor rather than area, because it was considered by us to be as reliable a measure of habitat as an area measure, given the difficulty of calculating intertidal and subtidal area from nautical charts of inadequate definition.

Formulae for the stratified mean, $\bar{y}_{st}$, its variance, $V(\bar{y}_{st})$, and 95% confidence intervals (CL_1, and CL_2) are:

$$\bar{y}_{st} = \frac{1}{N} \sum_{i=1}^{K} N_i \bar{y}_i$$

$$V(\bar{y}_{st}) = \frac{1}{N^2} \Sigma \frac{N_i S_i^2}{n_i} \quad (\frac{1}{n^2} \quad \Sigma \; (1-N_i/N) S_i^2)$$

$$CL_1, CL_2 = \bar{y}_{st} \pm t_{.05[n-1]} \times V(\bar{y}_{st})^{1/2}$$

where,

k = total # of strata

N = total weighting coefficient of all k strata

N_i = weighting coefficient of stratum i

n_i = # tows in stratum i

$\bar{y}_i = \sum_{j=i}^{n_i} y_{ij}/n_i$

y_{ij} = individual observation j in stratum i

S_i^2 = variance about stratified mean in stratum i

An additional term (i.e., $\frac{1}{n^2} \Sigma \; (1-N_i/N) S_i^2$) was attached to the variance because, according to Cochran (1977), when employing post-stratification, samples were not taken in proportion to the weight of each stratum. This term alleviates that particular problem.

RESULTS

Estuarine means and standard deviations are presented in Table 1. The stratified mean density index for the southern stock unit, 1975-82, and 95% confidence limits are shown in Table 2 and Figure 1. The computer generated analysis of both post-stratified data (1975-81) and 1982 data, wherein the number of stations sampled was proportionately allocated by estuary, indicates changes in relative year-class strength are reliably detected.

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Table 1. Winter flounder mean number (YOY/m^2), standard deviations, number of tows, and estuarine weighting factors for each estuary sampled on south shore of Cape Cod, 1975-1982.

		1975			1976			1977			1978			1979		
	Weighting Factor (n mi)	Mean	S.D.	# Tows	Mean	S.D.	# Tows	Mean	S.D.	# Tows	Mean	S.D.	# Tows	Mean	S.D.	# Tows
Great Pond	7.31	-	-	-	.434	.1851	18	.344	.2907	18	.346	.1669	12	.344	.4279	18
Waquoit Bay	17.38	.132	.0578	9	.379	.1316	18	.871	.5567	18	.609	.2843	18	.665	.2554	18
Cotuit Bay	24.08	-	-	-	.312	.3285	15	.468	.1342	15	.245	.2150	15	.659	.3422	15
Lewis Bay	9.37	.255	.2794	18	.566	.3391	18	1.400	.4983	18	.784	.8970	18	.591	.5349	18
Bass River	20.05	.487	.2624	15	.262	.1495	24	.612	.4110	24	.139	.1199	24	.312	.2615	24
Stage Harbor	11.66	-	-	-	.124	.1044	18	.138	.0901	18	.106	.0694	18	.195	.1593	18

		1980			1981			1982		
Great Pond	7.31	.572	.3024	15	.212	.1656	15	.499	.3275	12
Waquoit Bay	17.38	.660	.4735	18	.622	.5053	15	.326	.3347	30
Cotuit Bay	24.08	.423	.2442	15	.322	.1901	15	.271	.2768	39
Lewis Bay	9.37	.119	.0889	18	.598	.3263	18	1.206	1.0303	15
Bass River	20.05	.358	.1524	24	.176	.1568	20	.319	.1862	30
Stage Harbor	11.66	.124	.1362	18	.041	.0437	15	.061	.0494	18

Table 2. Stratified mean density indices (number of YOY winter flounder/m^2) and 95% confidence limits, 1975-1982.

Stock Unit	Year	No. of Stations	Stratified mean density index (No. YOY/m^2)	95% C.L.
South coast of Cape Cod	1975	14	0.31	0.293-0.327
	1976	37	0.33	0.318-0.342
	1977	37	0.62	0.602-0.638
	1978	35	0.34	0.322-0.358
	1979	37	0.49	0.473-0.507
	1980	36	0.40	0.386-0.414
	1981	33	0.33	0.315-0.345
	1982	48	0.38	0.359-0.401

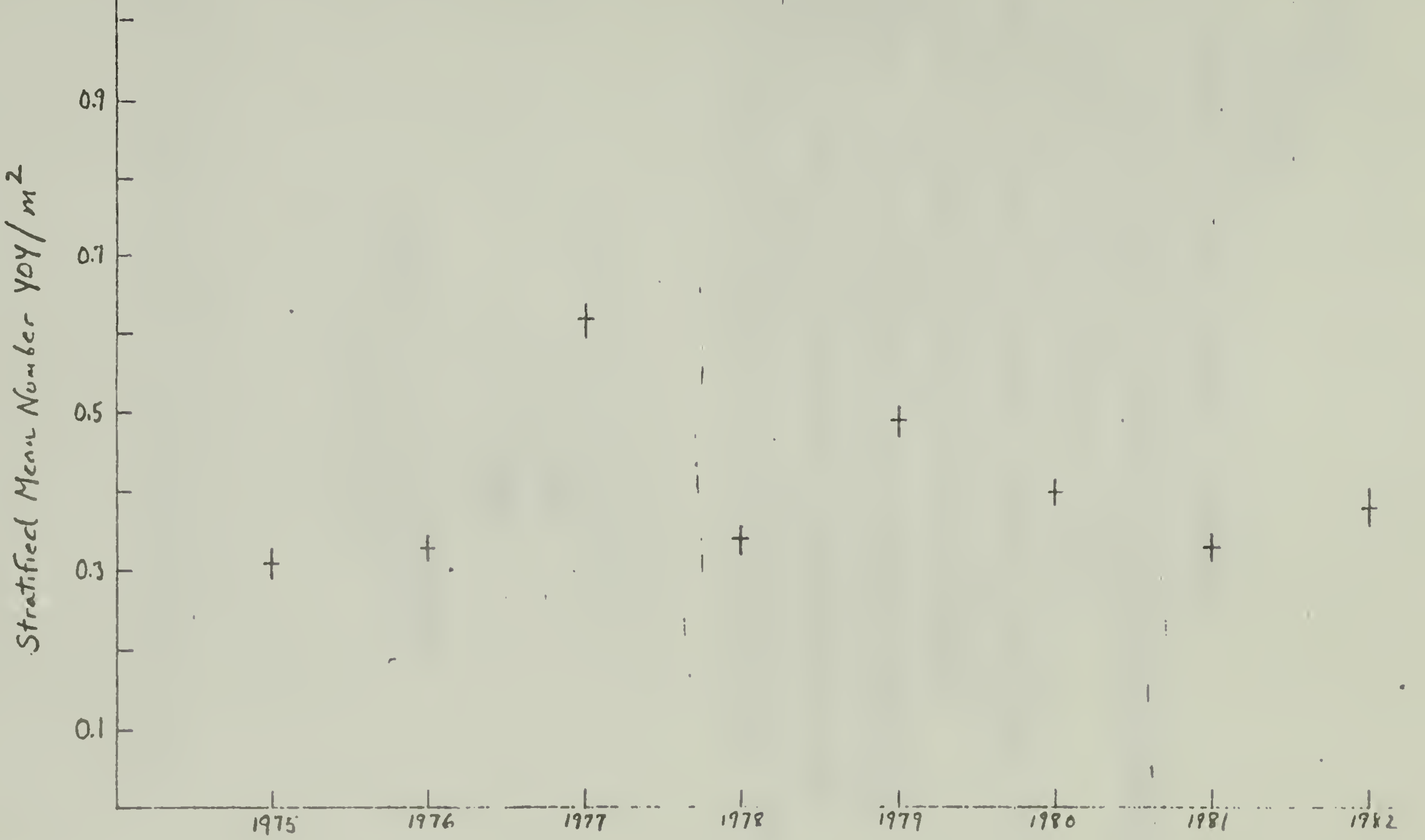

Figure 1. Stratified mean density index (number YOY winter flounder/m^2) for the southern stock unit, 1975-82. Horizontal bars represent means and vertical bars represent 0.95 confidence limits for the estimates of the means.

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